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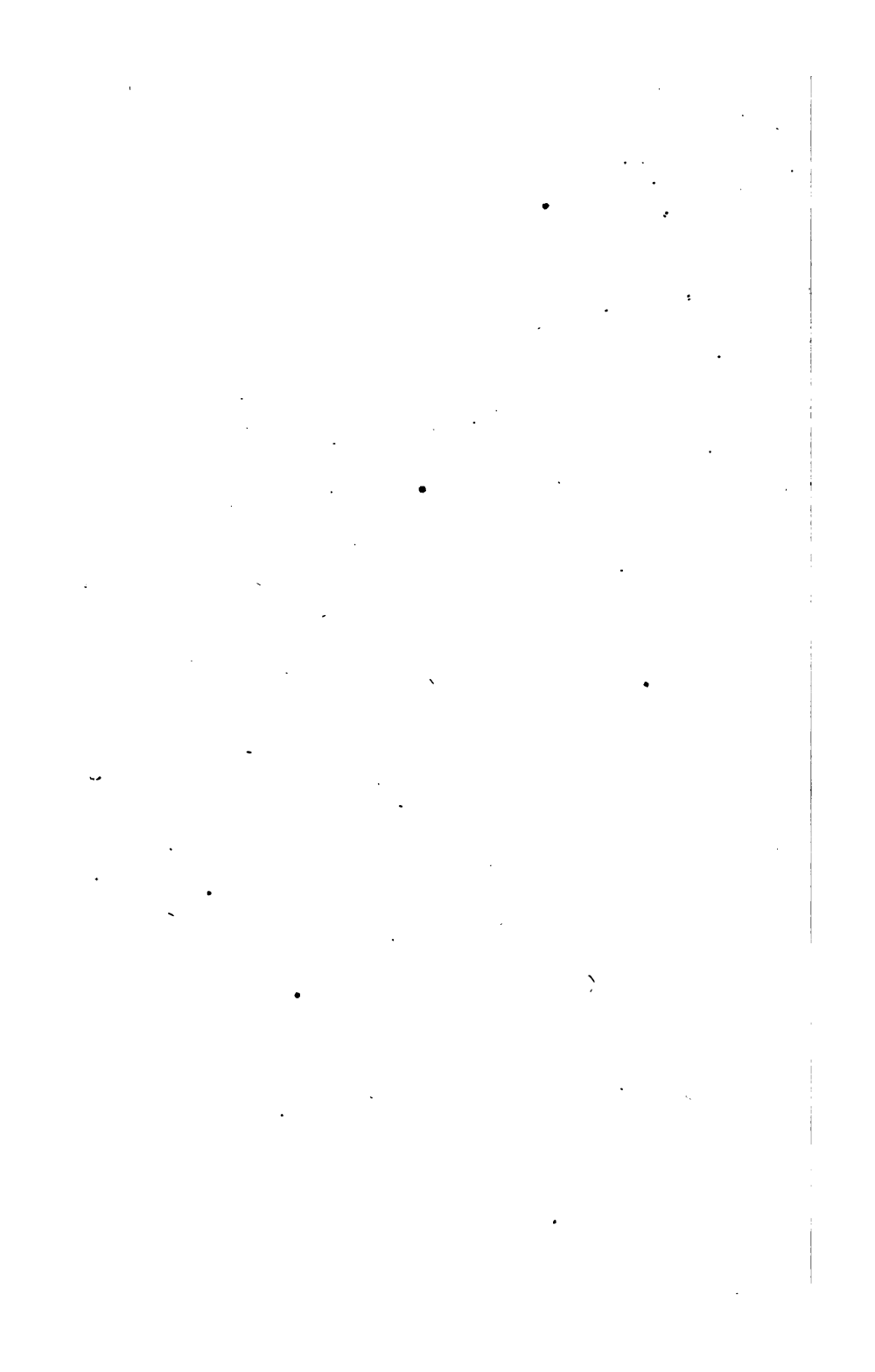


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O A
KEY
TO THE
INTRODUCTION
TO THE
NATIONAL ARITHMETIC,
EXHIBITING THE OPERATION OF
THE MORE DIFFICULT EXAMPLES
IN THAT WORK;
FOR THE USE OF TEACHERS ONLY.

By BENJAMIN GREENLEAF, A. M.
PRINCIPAL OF BRADFORD TEACHERS' SEMINARY.

New Stereotype Edition.

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1854.

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P R E F A C E.

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Every instructor, who has a large number of scholars under his care, is aware, that it is a great tax on his time, especially when in school, to examine the operation of many arithmetical questions; whereas, by the aid of a Key, he may readily detect any mistake in the operation. Besides, amid the labors of the school-room, it is often very difficult for the most able arithmetician to recollect, at the moment, all the principles involved in the solution of difficult questions; but, by recurring to a Key, this difficulty will be obviated.

The author would recommend to teachers, never to point out *directly* to the pupil the method of solving a problem, nor perform the labor for him, but suggest and explain such principles, as will enable him to perform the question himself.

The answers to all the examples in the Arithmetic are inserted in the Key, for the convenience of those teachers, who may prefer to use the edition of the Arithmetic, which does not contain the answers.

B. GREENLEAF.

Bradford, March 28, 1849.

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K E Y

* TO

GREENLEAF'S INTRODUCTION.

NOTATION AND NUMERATION.

ROMAN NOTATION.

2. (ART. 3, p. 8.)	LXXXVII.	6.	DXLII.
3.	CX.	7.	MCCCXIX.
4.	CLXIX.	8.	MDCCCXLVIII.
5.	CCLXXV.		

FRENCH NOTATION AND NUMERATION.

1. (ART. 13, p. 13.)	47	10.	408,096
2.	359	11.	5,402
3.	6,575	12.	907,805,074
4.	908	13.	347,915
5.	19,000	14.	89,047
6.	1,504	15.	51,081
7.	27,000,500	16.	7,395
8.	99,099	17.	57,659,099,047
9.	42,002,005		

ENGLISH NOTATION AND NUMERATION.

1. (ART. 16, p. 15.)	325,412
2.	214,165 ; 078,056
3.	42 ; 617,031 ; 041,342
4.	2,008 ; 009,082 ; 701,908
5.	168,247 ; 324,341 ; 472,319 ; 816,421

ADDITION.

3. (ART. 21, p. 21.)	978	7.	698
4.	889	8.	999
5.	998	9.	439
6.	669	10.	868
10. (ART. 24, p. 23.)	3555	38.	76833457
11.	3212	39.	1111110
12.	1922	40.	9323
13.	3175	41.	7693486
14.	27891	42.	3155917
15.	289436	43.	2643
16.	354409	44.	1039
17.	347514	45.	227934
18.	382898	46.	63315
19.	26027511	47.	2373544
20.	1366855	48.	8272 dollars.
21.	6908906	49.	131 trees.
22.	142885	50.	1563 pounds.
23.	21616	51.	2103 dollars.
24.	766503	52.	2257 dollars.
25.	13814	53.	500 dollars.
26.	969754	54.	9115 dollars.
27.	11720	55.	2234822
28.	31622	56.	5073577
29.	949661	57.	4597824
30.	86578	58.	4984097
31.	539658	59.	172246
32.	57372	60.	95947
33.	848340	61.	102201
34.	1000779	62.	100536
35.	694764	63.	113378
36.	156800	64.	86621
37.	1802790		

SUBTRACTION.

8. (Art. 32, p. 32.)	47896	27.	89901
9.	265899	28.	90909091
10.	587544	29.	999991
11.	377778	30.	2967
12.	9393239896470	31.	99995000
13.	1	32.	767 dollars.
14.	471112	33.	39 years.
15.	981012	34.	105 years.
16.	1	35.	366
17.	9998392	36.	219327 inhabitants
18.	6097700810072	37.	85423333 pounds.
19.	7977100909213	38.	1176249 bushels.
20.	7100061569937	39.	3528 dollars.
21.	500710920089	40.	18 dollars.
22.	1	41.	7965037 dollars.
23.	455555556	42.	577904
24.	8753086431	43.	2588 acres.
25.	799690466	44.	49841021 miles.
26.	24974975		

MULTIPLICATION.

9. (Art. 36, p. 38.)	6910677	14.	50246229
10.	7012310120	15.	60725 dollars.
11.	53580296	16.	228456 dollars.
12.	24881935	17.	27918 letters.
13.	105185376		

(Art. 40, p. 41.)		12.	10989 dollars.
8.	611 dollars.	13.	13505 miles.
9.	2813 dollars.	14.	8760 hours.
10.	35599 dollars.	15.	5481 gallons.
11.	1853654 dollars.	16.	200451 dollars.

KEY TO

17.	68816 pounds.	26.	532088
18.	321300	27.	3831635
19.	518077	28.	1462126
20.	881919	29.	264640056
21.	9691836	30.	99070437
22.	18219071	31.	826888542
23.	70287492	32.	290355807
24.	153288487686	33.	721361144
25.	49062139937803	34.	3798979491

2. (ART. 42, p. 43.)	765325	6.	2851200 inches.
3.	123396	7.	631152 hours.
4.	611226	8.	68520 feet.
5.	987625		

2. (ART. 43, p. 44.)	23560	4.	7964000
3.	587300	5.	9872500000

(ART. 44, p. 45.)		9.	69660900000000
4.	72103581726300	10.	910089999000
5.	490154012100000000	11.	24010024010000
6.	28522743249000	12.	400400800400400
7.	4179911100000	13.	1224241200000
8.	11717175236000	14.	14122412100

DIVISION.

(ART. 50, p. 50.)

	Quotients.	Rem.		Quotients.	Rem.
			14.	54848	5
5.	757913	0	15.	186529	6
6.	1460898	1	16.	958131	11
7.	141090	5	17.	1135791	1
8.	47316	4	18.	162255	6
9.	994864	8	19.	202818	6
10.	698082	1	20.	225353	3
11.	528776	9	21.	187794	2
12.	79992	4	22.	170721	9
13.	55096	6	23.	78715 dollars	

24.	17167 acres.	28.	99483 yards.
25.	876451 dollars.	29.	109517 acres.
26.	14888 dollars.	30.	371 dollars.
27.	9589 bushels.	31.	1315

	Quotients.	Rem.		Quotients.	Rem.
2. (ART. 51, p. 52.)	216	0	4.	13717421	0
3.	89786	10	5.	32534467	5

10. (ART. 54, p. 54.)	234		27.	5502	95
11.	365		28.	9755	4060
12.	145	6	29.	3453	7122
13.	7634	0	30.	30003	0
14.	5204	11	31.	26750	962
15.	290720	25	32.	86268755	480
16.	68549	88	33.	8428688	22346
17.	240415	5	34.	62927	2295060
18.	15608	5	35.	1099	200210510
19.	129725	66	36.	476 dollars.	
20.	144927	36	37.	395 acres.	
21.	14703	55	38.	763 dollars.	
22.	1919	55	39.	345 bushels each.	
23.	912	30	40.	389 dollars.	
24.	3502319	714	41.	1234 men.	
25.	26080418	234	42.	6538 ~~1111~~ dollars.	
26.	11058232	277			

2. (ART. 55, p. 56.)	30613	5.	7901
3.	1469	6.	182
4.	7546	7.	264

3. (ART. 56, p. 57.)	54	5.	77
4.	20	6.	405

	Quotients.	Rem.		Quotients.	Rem.
2. (ART. 57, p. 58.)	689	2	4.	24	815
3.	43	75	5.	9876	54321123

KEY TO

(ART. 58, p. 59.)		Quotients.		Rem.	
		Quotients.	Rem.		
2.	44	74	5.	1473	2597.
3.	332	192	6.	102	497654325
4.	667	253	7.	3491706185	306787
			8.	85	44916000000

CONTRACTIONS IN MULTIPLICATION.

(ART. 59, p. 60.)		3.	14197467925
2.	1914741450	4.	3086419725
(ART. 60, p. 60.)		3.	29037739400
2.	11892984700	4.	19454930400
(ART. 61, p. 60.)		3.	154320875
2.	995665625	4.	381232750
(ART. 62, p. 61.)		3.	876542123457
2.	1233332433	4.	999998000001

CONTRACTIONS IN DIVISION.

2. (ART. 63, p. 61.) 395061		4.	35999 $\frac{28}{100}$
3.	55157		
(ART. 64, p. 62.)		4.	143686 $\frac{8}{100}$
2.	29629629 $\frac{68}{100}$	5.	2690 $\frac{28}{100}$
3.	261371 $\frac{34}{100}$	6.	535 $\frac{62}{100}$
2. (ART. 65, p. 62.) 13825		5.	3917 $\frac{184}{1000}$
3.	3830106	6.	6689 $\frac{472}{1000}$
4.	4729879		

MISCELLANEOUS EXAMPLES.

1. (p. 63.)	584 dollars.	4.	1530 cents.
2.	25088 dollars.	5.	873 dollars.
3.	940 cents.	6.	4257 cents.

GREENLEAF'S INTRODUCTION.

11

7.	2106 miles.	27.	25
8.	61 miles.	28.	135442
9.	35405 dollars.	29.	144 feet.
10.	42884 dollars.	30.	123040 rods.
11.	7665 dollars.	31.	630 dollars.
12.	37 dollars.	32.	187 dollars.
13.	47 dollars.	33.	1188 dollars.
14.	1368 hours.	34.	413 dollars.
15.	5904 ounces.	35.	5430 dollars.
16.	56960 acres.	36.	457 dollars.
17.	234 dollars.	37.	Loss, 3 dollars.
18.	3178 dollars.	38.	Gain, 22 dollars.
19.	7581 dollars.	39.	The land, by 5136 dollars.
20.	Gain, 1488 cents.	40.	543 dollars.
21.	576 dollars.	41.	635 dollars.
22.	20 dollars.	42.	743 dollars.
23.	255 dollars.	43.	1828 dollars.
24.	3520	44.	133 dollars.
25.	1607	45.	27 dollars.
26.	5666	46.	533 dollars.

UNITED STATES MONEY.

(ART. 70, p. 69.)		5.	\$ 41.23
1.	12500 cents.	6.	15629 cents.
2.	345000 mills.	7.	16428 mills.
3.	29,7 cents.	8.	9870 mills.
4.	\$ 2.68,2		

ADDITION.

(ART. 71, p. 70.)		10.	\$ 13.87,0
5.	\$ 4408.88,8	11.	\$ 31.64,0
6.	\$ 410.46,9	12.	\$ 21.62,0
7.	\$ 448.36,8	13.	\$ 3.42,5
8.	\$ 4713.78,6	14.	\$ 15.00,0
9.	\$ 31.61,0	15.	\$ 48.32,0

KEY TO

SUBTRACTION.

5. (ART. 72, p. 71.)	\$ 52.66,4	10.	\$ 82.83,0
6.	\$ 71.97,6	11.	\$ 26.58,0
7.	\$ 724.89,8	12.	\$ 9.99,1
8.	\$ 782.20,6	13.	\$ 14.74,0
9.	\$ 65.98,0	14.	\$ 34.67,1

MULTIPLICATION.

(ART. 73, p. 72.)		8.	\$ 85.50
3.	\$ 44.55,0	9.	\$ 672.01
4.	\$ 414.64,0	10.	\$ 106 97
5.	\$ 7.31,0	11.	\$ 450.00
6.	\$ 30.87,5	12.	\$ 1600.50
7.	\$ 1774.25,0	13.	\$ 24327.96

DIVISION.

3. (ART. 74, p. 73.)	\$ 137.37	9.	\$ 0.93
4.	\$ 5.63	10.	\$ 3.28
5.	\$ 20.00	11.	\$ 11.67
6.	\$ 0.59	12.	\$ 4.68
7.	\$ 5.68	13.	\$ 132.55
8.	\$ 0.13	14.	\$ 5.75

PRACTICAL QUESTIONS BY ANALYSIS.

2. (ART. 76, p. 74.)	\$ 90.21	6.	\$ 68.40
3.	\$ 29.70	7.	\$ 5525.28
4.	\$ 42.21	8.	\$ 737.64
5.	\$ 728.19		

10. (ART. 77, p. 75.) $\$ 422.50 \div 65 = \$ 6.50$; $\$ 6.50 \times 15 = \$ 97.50$ Ans.

11. $\$ 2025 \div 45 = \$ 45$; $\$ 45 \times 180 = \$ 8100$ Ans.

12. $\$ 3.45 \div 5 = \$ 0.69$; $\$ 0.69 \times 11 = \$ 7.59$ Ans.

13. $\$ 214.50 \div 11 = \$ 19.50$; $\$ 19.50 \times 87 = \$ 1696.50$ Ans.

14. $\$ 60.00 \div 8 = \$ 7.50$; $\$ 7.50 \times 87 = \$ 652.50$ Ans.

15. $\$ 5.58 \div 9 = \$ 0.62$; $\$ 0.62 \times 43 = \$ 26.66$ Ans.

16. $\$ 85 \div 5 = \$ 17$; $\$ 17 \times 97 = \$ 1649$ Ans.

17. $\$3.80 \div 20 = \$0.19$; $\$0.19 \times 59 = \$11.21$ Ans.
 18. $\$472.50 \div 27 = \$17.50$; $\$17.50 \times 12 = \$210$ Ans.
 19. $\$39.69 \div 7 = \$5.67$; $\$5.67 \times 57 = \$323.19$ Ans.
 20. $\$10.08 \div 144 = \$0.07$; $\$0.07 \times 359 = \$25.13$ Ans.
 21. $\$77.13 \div 857 = \$0.09$; $\$0.09 \times 359 = \$32.31$ Ans.
 22. $\$187.53 \div 987 = \$0.19$; $\$0.19 \times 329 = \$62.51$ Ans.
 23. $\$26.32 \div 47 = \$0.56$; $\$0.56 \times 39 = \$21.84$ Ans.
 25. (ART. 78, p. 76.) $\$175 \div \$5 = 35$ reams, Ans.
 26. $\$217.50 \div \$7.50 = 29$ barrels, Ans.
 27. $\$4875 \div \$75 = 65$ tons, Ans.
 28. $\$1728 \div \$4 = 432$ yards, Ans.
 29. $\$9.66 \div \$0.69 = 14$ hundred weight, Ans.
 30. $\$66.51 \div \$7.39 = 9$ barrels, Ans.
 31. $\$136.50 \div \$3.25 = 42$ cords, Ans.

BILLS.

(ART. 79, p. 77.)

(1.) J. Smith.

$$\begin{array}{r} \$0.75 \times 82 = \$61.50 \\ 0.92 \times 89 = 81.88 \\ 0.50 \times 24 = 12.00 \\ \hline \$155.38 \end{array}$$

(2.) L. Webster.

$$\begin{array}{r} \$0.18 \times 6 = \$1.08 \\ 0.20 \times 12 = 2.40 \\ 1.80 \times 6 = 10.80 \\ 0.26 \times 30 = 7.80 \\ \hline \$22.08 \end{array}$$

(3.) J. Kimball.

$$\begin{array}{r} \$0.63 \times 14 = \$8.82 \\ 0.88 \times 12 = 10.56 \\ 0.62 \times 23 = 14.26 \\ 1.27 \times 16 = 20.32 \\ 2.25 \times 17 = 38.25 \\ \hline \$92.21 \end{array}$$

(4.) W. Greenleaf.

$$\begin{array}{r} \$0.50 \times 86 = \$43.00 \\ 0.86 \times 90 = 77.40 \\ 11.00 \times 18 = 198.00 \\ 3.50 \times 23 = 80.50 \\ 0.62 \times 14 = 8.68 \\ 12.12 \times 12 = 145.44 \\ 12.00 \times 46 = 552.00 \\ \hline \$1105.02 \end{array}$$

KEY TO

(5.) A. Dow.

$$\$23.75 \times 37 = \$878.75$$

$$17.50 \times 42 = 735.00$$

$$99.00 \times 43 = 4257.00$$

$$175.00 \times 12 = 2100.00$$

$$7.00 \times 19 = 133.00$$

$$1.52 \times 23 = 34.96$$

$$\underline{\$8138.71}$$

(6.) N. Webster.

$$\$1.20 \times 80 = \$96.00$$

$$3.00 \times 17 = 51.00$$

$$1.08 \times 19 = 20.52$$

$$0.75 \times 23 = 17.25$$

$$\underline{\$184.77}$$

(7.) S. Osgood.

$$\$0.20 \times 27 = \$5.40$$

$$3.90 \times 10 = 39.00$$

$$4.75 \times 7 = 33.25$$

$$2.93 \times 19 = 55.67$$

$$0.37 \times 20 = 7.40$$

$$\underline{\$140.72}$$

REDUCTION.

(ART. 86, p. 86.)

(3.)

$$9\text{£. } 18\text{s. } 7\text{d.}$$

$$\underline{20}$$

$$198\text{s.}$$

$$\underline{12}$$

$$2383\text{d. Ans.}$$

(4.)

$$12)2383\text{d.}$$

$$20)198\text{s. } 7\text{d.}$$

$$\text{Ans. } 9\text{£. } 18\text{s. } 7\text{d.}$$

(5.)

$$14\text{£. } 11\text{s. } 5\text{d. } 2\text{qr.}$$

$$\underline{20}$$

$$291\text{s.}$$

$$\underline{12}$$

$$3497\text{d.}$$

$$\underline{4}$$

$$13990\text{qr. Ans.}$$

(6.)

$$4)13990\text{qr.}$$

$$12)3497\text{d. } 2\text{qr.}$$

$$20)291\text{s. } 5\text{d.}$$

$$\text{Ans. } 14\text{£. } 11\text{s. } 5\text{d. } 2\text{qr.}$$

(ART. 87, p. 88.)

$$\begin{array}{r}
 (3.) \\
 76\text{dwt. } 12\text{gr.} \\
 \underline{24} \\
 306 \\
 \underline{153} \\
 \text{Ans. } 1836\text{gr.}
 \end{array}$$

$$\begin{array}{r}
 (4.) \\
 24)1836\text{gr.} \\
 \hline
 \text{Ans. } 76\text{dwt. } 12\text{gr.}
 \end{array}$$

$$\begin{array}{r}
 (5.) \\
 76\text{lb. } 5\text{oz.} \\
 \underline{12} \\
 917\text{oz.} \\
 \underline{20} \\
 18340\text{dwt.} \\
 \underline{24}
 \end{array}$$

Ans. 440160gr.

$$\begin{array}{r}
 (6.) \\
 24)440160\text{gr.} \\
 \underline{20}18340\text{dwt.} \\
 12)917\text{oz.} \\
 \hline
 \text{Ans. } 76\text{lb. } 5\text{oz.}
 \end{array}$$

$$\begin{array}{r}
 (7.) \\
 144\text{lb. } 9\text{oz.} \\
 \underline{12} \\
 1737\text{oz.} \\
 \underline{20} \\
 \hline
 \text{Ans. } 34740\text{dwt.}
 \end{array}$$

$$\begin{array}{r}
 (8.) \\
 20)34740\text{dwt.} \\
 \underline{12}1737\text{oz.} \\
 \hline
 \text{Ans. } 144\text{lb. } 9\text{oz.}
 \end{array}$$

$$\begin{array}{r}
 (9.) \\
 24)17895\text{gr.} \\
 \underline{20}745\text{dwt. } 15\text{gr.} \\
 12)37\text{oz. } 5\text{dwt.} \\
 \hline
 \text{Ans. } 3\text{lb. } 1\text{oz.} \\
 [5\text{dwt. } 15\text{gr.}]
 \end{array}$$

$$\begin{array}{r}
 (10.) \\
 3\text{lb. } 1\text{oz. } 5\text{dwt. } 15\text{gr.} \\
 \underline{12} \\
 37\text{oz.} \\
 \underline{20} \\
 745\text{dwt.} \\
 \underline{24} \\
 \hline
 \text{Ans. } 17895\text{gr.}
 \end{array}$$

$$\begin{array}{r}
 (11.) \\
 2\text{oz. } 18\text{dwt. } 12\text{gr.} \\
 \underline{20} \\
 58\text{dwt.} \\
 \underline{24} \\
 1404\text{gr.} \\
 \underline{1.37} \\
 \hline
 \text{Ans. } \$ 1923.48
 \end{array}$$

(ART. 88, p. 89.)

$$\begin{array}{r}
 (3.) \\
 76\text{lb} \\
 \underline{12} \\
 912\frac{5}{8} \\
 \underline{8} \\
 7296\frac{3}{8} \\
 \underline{3} \\
 21888\text{Ans.}
 \end{array}$$

$$\begin{array}{r}
 (4.) \\
 3)21888\text{Ans.} \\
 \underline{8}7296\frac{3}{8} \\
 12)912\frac{5}{8} \\
 \hline
 \text{Ans. } 76\text{lb}
 \end{array}$$

$$\begin{array}{r}
 (5.) \\
 144\text{lb} \\
 \underline{12} \\
 1728\frac{3}{8} \\
 \underline{8} \\
 13824\frac{3}{8} \\
 \underline{3} \\
 41472\text{Ans.} \\
 \underline{20}
 \end{array}$$

Ans. 829440gr.

$$\begin{array}{r}
 (6.) \\
 20)829440\text{gr.} \\
 \underline{3}41472\text{Ans.} \\
 8)13824\frac{3}{8} \\
 \underline{12}1728\frac{3}{8} \\
 \hline
 \text{Ans. } 144\text{lb}
 \end{array}$$

(7.)	(8.)	(9.)
12lb 83 33 10 18gr.	20)73178gr.	73 63 20
<u>12</u>	<u>3)36580 18gr.</u>	<u>8</u>
1523	8)12193 10	623
<u>8</u>	<u>12)1523 33</u>	<u>3</u>
12193	Ans. 188 doses.	
<u>3</u>	Ans. 12lb 83 33 10 18gr.	
36580		
<u>20</u>		
73178gr. Ans.		

(Art. 89, p. 90.)

(3.)	(4.)
16T. 19cwt. 0qr. 10lb. 11oz. 5dr.	16)9722549dr.
<u>20</u>	<u>16)607659oz. 5dr.</u>
339cwt.	28)37978lb. 11oz.
<u>4</u>	<u>4)1356qr. 10lb.</u>
1356qr.	20)339cwt. 0qr.
<u>28</u>	Ans. 16T. 19cwt. 0qr. 10lb. 11oz. 5dr.
37978lb.	
<u>16</u>	
607659oz.	
<u>16</u>	
9722549dr. Ans.	

(5.)	(6.)	(7.)	(8.)
679cwt.	28)76048lb.	17cwt. 3qr. 18lb.	48T. 17cwt.
<u>4</u>	<u>4)2716qr.</u>	<u>4</u>	<u>20</u>
2716qr.	Ans. 679cwt.	71qr.	977cwt.
<u>28</u>		<u>28</u>	<u>4</u>
76048lb. Ans.		2006lb.	3908qr.
		<u>.07</u>	<u>28</u>
	Ans. \$ 140.42		109424lb.
			<u>.08</u>
			Ans. \$ 8753.92

(ART. 90, p. 92.)

$$\begin{array}{r} (3.) \\ 144\text{yd. 3qr.} \\ \underline{4} \\ \text{Ans. 579qr.} \end{array}$$

$$\begin{array}{r} (4.) \\ 4)579\text{qr.} \\ \text{Ans. 144yd. 3qr.} \end{array}$$

$$\begin{array}{r} (5.) \\ 17\text{ E.E. 4qr. 3na.} \\ \underline{5} \\ 89\text{qr.} \\ \underline{4} \\ \text{Ans. 359na.} \end{array}$$

$$\begin{array}{r} (6.) \\ 4)359\text{na.} \\ 5)89\text{qr. 3na.} \\ \text{Ans. 17 E. E. 4qr. 3na.} \end{array}$$

$$\begin{array}{r} (7.) \\ 126\text{yd. 0qr. 3na.} \\ \underline{4} \\ 504\text{qr.} \\ \underline{4} \\ \text{Ans. 2019na.} \end{array}$$

$$\begin{array}{r} (8.) \\ 4)2019\text{na.} \\ 4)504\text{qr. 3na.} \\ \text{Ans. 126yd. 0qr. 3na.} \end{array}$$

$$\begin{array}{r} (9.) \\ 49\text{yd. 3qr.} \\ \underline{4} \\ 199\text{qr.} \\ 2.17 \\ \text{Ans. \$ 431.83} \end{array}$$

$$\begin{array}{r} (10.) \\ 144\text{yd. 1qr. 3na.} \\ \underline{4} \\ 577\text{qr.} \\ \underline{4} \\ 2311\text{na.} \\ .25 \end{array}$$

$$\text{Ans. \$ 577.75}$$

(ART. 91, p. 93.)

$$\begin{array}{r} (3.) \\ 47\text{m.} \\ \underline{8} \\ 376\text{fur.} \\ \underline{40} \\ 15040\text{rd.} \\ \underline{16\frac{1}{2}} \\ \text{Ans. 248160ft.} \end{array}$$

$$\begin{array}{r} (4.) \\ 16\frac{1}{2})248160\text{ft.} \\ 40)15040\text{rd.} \\ 8)376\text{fur.} \\ \text{Ans. 47m.} \end{array}$$

(5.)	(6.)
78deg. 50m. 7fur. 30rd. 5yd. 2ft. 10in.	12)346704154in.
69½	3)28892012ft. 10in.
5471m.	5½)9630670yd. 2ft.
8	40)1751030rd. 5yd.
43775fur.	8)43775fur. 30rd.
40	69½)5471m. 7fur.
1751030rd.	Ans. 78deg. 50m. 7fur. 30rd.
5½	[5yd. 2ft. 10in.]
9630670yd.	
3	
28892012ft.	
12	
346704154in. Ans.	

(ART. 92, p. 95.)

(3.)	(4.)	(5.)
80)4386cha.	54m. 66cha.	75m. 49cha.
Ans. 54m. 66cha.	80	80
	Ans. 4386cha.	6049cha.
		4
(6.)	(7.)	
4)24196 poles.	7m. 4fur. 30rd.	Ans. 24196 poles.
80)6049cha.	8	
Ans. 75m. 49cha.	60fur.	(8.)
	40	25)60750li.
	2430rd.	40)2430rd.
	25	8)60fur. 30rd.
	Ans. 60750li.	Ans. 7m. 4fur. 30rd.

(ART. 93, p. 97.)

(3.)	(4.)
49A. 3R. 16p.	272½)2171466ft.
4	40)7976p.
199R.	4)199R. 16p.
40	Ans. 49A. 3R. 16p.
7976p.	
272½	
Ans. 2171466ft.	

(5.) $\begin{array}{r} 365A. 3R. 17p. \\ \underline{4} \\ 1463R. \\ \underline{40} \\ 58537p. \\ \underline{1.75} \\ \text{Ans. \$ } 102,439.75 \end{array}$	(6.) $\begin{array}{r} 3A. 1R. 30p. \\ \underline{4} \\ 13R. \\ \underline{40} \\ 550p. \\ \underline{272\frac{1}{2}} \\ 149737\frac{1}{2}ft. \\ \underline{1.25} \\ \text{Ans. \$ } 187171.87,5 \end{array}$
---	--

(7.) $\begin{array}{r} 12m. \\ \underline{12} \\ 144 \text{ sq. m.} \\ \underline{640} \\ \text{Ans. } 92160A. \end{array}$	(8.) $\begin{array}{r} 18A. 0R. 16p. \\ \underline{4} \\ 72R. \\ \underline{40} \\ 2896p. \\ \underline{272\frac{1}{2}} \\ \text{Ans. } 788436 \text{ sq. ft.} \end{array}$	(9.) $\begin{array}{r} 48A. 3R. 14p. \\ \underline{4} \\ 195R. \\ \underline{40} \\ 7814p. \\ \underline{.90} \\ \text{Ans. \$ } 7032.60 \end{array}$
--	--	--

(ART. 94, p. 99.)

(3.) $\begin{array}{r} 45C. \\ \underline{128} \\ 5760ft. \\ \underline{1728} \\ 9953280 \text{ cu. in., Ans.} \end{array}$	(4.) $\begin{array}{r} 1728 \overline{) 9953280} \text{ cu. in.} \\ \underline{128} \overline{) 5760} ft. \\ \text{Ans. } 45C. \end{array}$	(5.) $\begin{array}{r} 15ft. \\ \underline{4} \\ 60 \\ \underline{6\frac{1}{2}} \\ 128 \overline{) 390} \text{ cu. ft.} \\ \text{Ans. } 3C. 6ft. \end{array}$
(6.) $\begin{array}{r} 4ft. \\ \underline{3\frac{1}{2}} \\ 13 \\ \underline{2} \\ 26 \text{ cu. ft.} \\ \underline{1728} \\ \text{Ans. } 44928 \text{ cu. in.} \end{array}$	(7.) $\begin{array}{r} 14 \\ \underline{12} \\ 168 \\ \underline{8} \\ \text{Ans. } 1344 \text{ cu. ft.} \end{array}$	

(ART. 95, p. 100.)

(3.)

197 tuns 3hhd. 60gal. 3qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 791\text{hhd.} \\
 63 \\
 \hline
 49893\text{gal.} \\
 4 \\
 \hline
 199575\text{qt.} \\
 2 \\
 \hline
 399151\text{pt.} \\
 4 \\
 \hline
 \end{array}$$

Ans. 1596604gi.

(4.)

$$\begin{array}{r}
 4)1596604\text{gi.} \\
 2)399151\text{pt.} \\
 4)199575\text{qt. 1pt.} \\
 63)49893\text{gal. 3qt.} \\
 4)791\text{hhd. 60gal.}
 \end{array}$$

Ans. 197 tuns 3hhd. 60ga. .
[3qt. 1pt.]

(5.)

$$\begin{array}{r}
 7 \\
 \hline
 63 \\
 \hline
 441\text{gal.} \\
 4 \\
 \hline
 1764\text{qt.} \\
 2 \\
 \hline
 3528\text{pt.} \\
 .05 \\
 \hline
 \end{array}$$

Ans. \$ 176.40 .

(6.)

$$\begin{array}{r}
 18\text{ tuns 1hhd. 47gal.} \\
 4 \\
 \hline
 73\text{hhd.} \\
 63 \\
 \hline
 4646\text{gal.} \\
 1.25 \\
 \hline
 \end{array}$$

Ans. \$ 5807.50

(ART. 96, p. 102.)

(3.)

4 tuns 1hhd. 17gal. 0qt. 1pt.

$$\begin{array}{r}
 4 \\
 \hline
 17\text{hhd.} \\
 54 \\
 \hline
 935\text{gal.} \\
 4 \\
 \hline
 3740\text{qt.} \\
 2 \\
 \hline
 \end{array}$$

7481pt. Ans.

(4.)

2)7481pt.

4)3740qt. 1pt.

54)935gal.

4)17hhd. 17gal.

Ans. 4 tuns 1hhd. 17gal. 0qt. 1pt.

(5.)

7hhd. 18gal.

$$\begin{array}{r}
 54 \\
 \hline
 396\text{gal.} \\
 4 \\
 \hline
 1584\text{qt.} \\
 .04 \\
 \hline
 \end{array}$$

\$ 63.36 Ans.

(6.)

18

54

972gal.

.15

Ans. \$ 145.80

(ART. 97, p. 103.)

(3.) $\begin{array}{r} 97\text{ch. } 30\text{bu. } 2\text{pk.} \\ \underline{36} \\ 3522\text{bu.} \\ \underline{4} \\ 14090\text{pk.} \\ \underline{8} \\ 112720\text{qt., Ans.} \end{array}$	(5.) $\begin{array}{r} 35\text{bu. } 0\text{pk. } 0\text{qt. } 1\text{pt.} \\ \underline{4} \\ 140\text{pk.} \\ \underline{8} \\ 1120\text{qt.} \\ \underline{2} \\ 2241\text{pt., Ans.} \end{array}$	(4.) $\begin{array}{r} 8)112720\text{qt.} \\ 4)14090\text{pk.} \\ 36)3522\text{bu. } 2\text{pk.} \\ \text{Ans. } 97\text{ch. } 30\text{bu.} \\ \quad [2\text{pk.}] \end{array}$
---	--	--

(6.) $\begin{array}{r} 2)2241\text{pt.} \\ 8)1120\text{qt. } 1\text{pt.} \\ 4)140\text{pk.} \\ \text{Ans. } 35\text{bu. } 0\text{pk. } 0\text{qt. } 1\text{pt.} \end{array}$	(7.) $\begin{array}{r} 18\text{qr. } 0\text{bu. } 3\text{pk. } 5\text{qt.} \\ \underline{8} \\ 144\text{bu.} \\ \underline{4} \\ 579\text{pk.} \\ \underline{8} \\ \text{Ans. } 4637\text{qt.} \end{array}$	(8.) $\begin{array}{r} 8)4637\text{qt.} \\ 4)579\text{pk. } 5\text{qt.} \\ 8)144\text{bu. } 3\text{pk.} \\ \text{Ans. } 18\text{qr. } 0\text{bu. } 3\text{pk.} \\ \quad [5\text{qt}] \end{array}$
---	--	--

(9.) $\begin{array}{r} 19\text{bu. } 3\text{pk. } 7\text{qt. } 1\text{pt.} \\ \underline{4} \\ 79\text{pk.} \\ \underline{8} \\ 639\text{qt.} \\ \underline{2} \\ \text{Ans. } 1279\text{pt.} \end{array}$	(10.) $\begin{array}{r} 2)1279\text{pt.} \\ 8)639\text{qt. } 1\text{pt.} \\ 4)79\text{pk. } 7\text{qt.} \\ \text{Ans. } 19\text{bu. } 3\text{pk. } 7\text{qt. } 1\text{pt.} \end{array}$
---	---

(ART. 98, p. 105.)

(3.) $\begin{array}{r} 296\text{da. } 18\text{h. } 32\text{m.} \\ \underline{24} \\ 7122\text{h.} \\ \underline{60} \\ \text{Ans. } 427352\text{m.} \end{array}$	(4.) $\begin{array}{r} 60)427352\text{m.} \\ 24)7122\text{h. } 32\text{m.} \\ \text{Ans. } 296\text{da. } 18\text{h. } 32\text{m.} \end{array}$
---	--

(5.)

365da. 5h. 48m. 57sec.

24

8765h.

60

525948m.

60

31556937sec.

30 years.

946708110

22699722sec.

Ans. 969407832sec.

262da. 17h. 28m. 42sec.

24

6305h.

60

378328m.

60

22699722sec.

(6.)

365da. 5h. 48m. 57sec. 31556937)969407832(30 years.

24

946708110

8765h.

60)22699722sec.

60

60)378328m. 42sec.

525948m.

24)6305h. 28m.

60

262da. 17h.

31556937 seconds in a solar year.

Ans. 30y. 262da. 17h. 28m. 42sec.

(7.)

60)684592m.

24)11409h. 52m.

7)475da. 9h.

Ans. 67w. 6da. 9h. 52m.

(8.)

67w. 6da. 9h. 52m.

7

475da.

24

11409h.

60

Ans. 684592m.

(ART. 99, p. 106.)

(3.)

27S. 19° 51' 28"

30

829°

60

49791'

60

Ans. 2987488"

(4.)

60)2987488"

60)49791' 28"

30)829° 51'

Ans. 27S. 19° 51' 28"

MISCELLANEOUS EXERCISES.

1. (p. 107.) $\$345 \times 100 = 34500$; $34500 + 18 = 34518$;
 $34518 \times 10 = 345180$ mills, Ans.
2. $345180 \text{ mills} \div 10 = 34518$; $34518 + 100 = \$345.18$, Ans.
3. $46\text{s.} \times 20 = 920\text{s.}$; $920\text{s.} + 18\text{s.} = 938\text{s.}$; $938\text{s.} \times 12 = 11256\text{d.}$; $11256\text{d.} + 5\text{d.} = 11261\text{d.}$; $11261\text{d.} \times 4 = 45044\text{qr.}$ Ans.
4. $45044\text{qr.} \div 4 = 11261\text{d.}$; $11261\text{d.} + 12 = 938\text{s.}$ 5d.;
 $938\text{s.} \div 20 = 46\text{s.}$ 18s. 5d. Ans.
5. $61\text{lb.} \times 12 = 732\text{oz.}$; $732\text{oz.} \times 20 = 14640\text{dwt.}$; $14640\text{dwt.} + 17\text{dwt.} = 14657\text{dwt.}$; $14657\text{dwt.} \times 24 = 351768\text{gr.}$;
 $351768\text{gr.} + 17\text{gr.} = 351785\text{gr.}$ Ans.
6. $351785\text{gr.} \div 24 = 14657\text{dwt.}$ 17gr.; $14657\text{dwt.} + 20 = 732\text{oz.}$ 17dwt.; $732\text{oz.} \div 12 = 61\text{lb.}$ 0oz. 17dwt. 17gr. Ans.
7. $27\text{lb} \times 12 = 324\text{s}$; $324\text{s} + 3\text{s} = 327\text{s}$; $327\text{s} \times 8 = 2616\text{s}$; $2616\text{s} + 13 = 2617\text{s}$; $2617\text{s} \times 3 = 7851\text{D}$;
 $7851\text{D} + 1\text{D} = 7852\text{D}$ Ans.
8. $7852\text{D} \div 3 = 2617\text{s}$ 1D; $2617\text{s} + 8 = 327\text{s}$ 13; $327\text{s} + 12 = 27\text{lb}$ 3s 13 1D Ans.
9. $83\text{T.} \times 20 = 1660\text{cwt.}$; $1660\text{cwt.} + 11\text{cwt.} = 1671\text{cwt.}$;
 $1671\text{cwt.} \times 4 = 6684\text{qr.}$; $6684\text{qr.} + 3\text{qr.} = 6687\text{qr.}$;
 $6687\text{qr.} \times 28 = 187236\text{lb.}$; $187236\text{lb.} + 18\text{lb.} = 187254\text{lb.}$;
 $187254\text{lb.} \times 16 = 2996064\text{oz.}$ Ans.
10. $2996064\text{oz.} + 16 = 187254\text{lb.}$; $187254\text{lb.} + 28 = 6687\text{qr.}$;
 18lb. ; $6687\text{qr.} \div 4 = 1671\text{cwt.}$ 3qr.; $1671\text{cwt.} + 20 = 83\text{T.}$ 11cwt. 3qr. 18lb. Ans.
11. $97\text{yd.} \times 4 = 388\text{qr.}$; $388\text{qr.} + 3\text{qr.} = 391\text{qr.}$; $391\text{qr.} \times 4 = 1564\text{na.}$; $1564\text{na.} + 3\text{na.} = 1567\text{na.}$ Ans.
12. $1567\text{na.} \div 4 = 391\text{qr.}$ 3na.; $391\text{qr.} + 4 = 97\text{yd.}$ 3qr. 3na. Ans.
13. $57\text{ E. E.} \times 5 = 285\text{qr.}$; $285\text{qr.} + 4 = 71\text{yd.}$ 1qr. Ans.
14. $71\text{yd.} \times 4 = 284\text{qr.}$; $284\text{qr.} + 1\text{qr.} = 285\text{qr.}$; $285\text{qr.} + 5 = 57\text{ E. E.}$ Ans.

15. $15\text{m.} \times 8 = 120\text{fur.}$; $120\text{fur.} + 7\text{fur.} = 127\text{fur.}$; $127\text{fur.} \times 40 = 5080\text{rd.}$; $5080\text{rd.} + 18\text{rd.} = 5098\text{rd.}$; $5098\text{rd.} \times 16\frac{1}{2} = 84117\text{ft.}$; $84117\text{ft.} + 10\text{ft.} = 84127\text{ft.}$; $84127\text{ft.} \times 12 = 1009524\text{in.}$; $1009524\text{in.} + 6\text{in.} = 1009530\text{in.}$ Ans.
16. $1009530\text{in.} + 12 = 84127\text{ft.}$ 6in.; $84127\text{ft.} + 16\frac{1}{2} = 5098\text{rd.}$ 10ft.; $5098\text{rd.} + 40 = 127\text{fur.}$ 18rd.; $127\text{fur.} + 8 = 15\text{m.}$ 7fur. 18rd. 10ft. 6in. Ans.
17. $95,000,000\text{ miles} \times 8 = 760000000\text{ furlongs}$; $760000000\text{ furlongs} \times 40 = 30400000000\text{ rods}$; $30400000000\text{ rods} \times 16\frac{1}{2} = 501600000000\text{ feet}$; $501600000000\text{ feet} \times 12 = 6,019,200,000,000\text{ inches}$, Ans.
18. $6,019,200,000,000\text{in.} \div 12 = 501600000000\text{ft.}$; $501600000000\text{ft.} \div 16\frac{1}{2} = 30400000000\text{rd.}$; $30400000000\text{rd.} + 40 = 760000000\text{fur.}$; $760000000\text{fur.} \div 8 = 95,000,000\text{ miles}$, Ans.
19. $48\text{deg.} \times 69\frac{1}{2} = 3336\text{m.}$; $3336\text{m.} + 18\text{m.} = 3354\text{m.}$; $3354\text{m.} \times 8 = 26832\text{fur.}$; $26832\text{fur.} + 7\text{fur.} = 26839\text{fur.}$; $26839\text{fur.} \times 40 = 1073560\text{rd.}$; $1073560\text{rd.} + 18\text{rd.} = 1073578\text{rd.}$; $1073578\text{rd.} \times 16\frac{1}{2} = 17714037\text{ft.}$ Ans.
20. $17714037\text{ft.} + 16\frac{1}{2} = 1073578\text{rd.}$; $1073578\text{rd.} \div 40 = 26839\text{fur.}$ 18rd.; $26839\text{fur.} + 8 = 3354\text{m.}$ 7fur.; $3354\text{m.} + 69\frac{1}{2} = 48\text{deg.}$ 18m. 7fur. 18rd. Ans.
21. $7\text{A.} \times 4 = 28\text{R.}$; $28\text{R.} + 3\text{R.} = 31\text{R.}$; $31\text{R.} \times 40 = 1240\text{p.}$; $1240\text{p.} + 16\text{p.} = 1256\text{p.}$; $1256\text{p.} \times 272\frac{1}{2} = 341946\text{ft.}$; $341946\text{ft.} + 218\text{ft.} = 342164\text{ft.}$ Ans.
22. $342164\text{ft.} + 272\frac{1}{2} = 1256\text{p.}$ 218ft.; $1256\text{p.} + 40 = 31\text{R.}$ 16p.; $31\text{R.} + 4 = 7\text{A.}$ 3R. 16p. 218ft. Ans.
23. $25\text{ S. M.} \times 640 = 16000\text{A.}$; $16000\text{A.} \times 160 = 2560000\text{p.}$; $2560000\text{p.} \times 272\frac{1}{2} = 696960000\text{ft.}$; $696960000\text{ft.} \times 144 = 100362240000\text{in.}$ Ans.
24. $100362240000\text{in.} \div 144 = 696960000\text{ft.}$; $696960000\text{ft.} \div 272\frac{1}{2} = 2560000\text{p.}$; $2560000\text{p.} \div 160 = 16000\text{A.}$; $16000\text{A.} + 640 = 25\text{ square miles}$, Ans.
25. $15\text{T.} \times 40 = 600\text{ft.}$; $600\text{ft.} \times 1728 = 1036800\text{in.}$ Ans.
26. $1036800\text{in.} + 1728 = 600\text{ft.}$; $600\text{ft.} \div 40 = 15\text{T.}$ Ans.

27. 5hhd. $\times$ 63 = 315gal. ; 315gal. $+$ 17gal. = 332gal. ;
 332gal. $\times$ 4 = 1328qt. ; 1328qt. $+$ 3qt. = 1331qt. .
 1331qt. $\times$ 2 = 2662pt. ; 2662pt. $\times$ 4 = 10648 gills, Ans.
28. 10648gi. $\div$ 4 = 2662pt. ; 2662pt. $\div$ 2 = 1331qt. ; 1331qt.
 $\div$ 4 = 332gal. 3qt. ; 332gal. $\div$ 63 = 5hhd. 17gal. 3qt.
 Ans.
29. 29hhd. $\times$ 54 = 1566gal. ; 1566gal. $+$ 30gal. = 1596gal. ;
 1596gal. $\times$ 4 = 6384qt. ; 6384qt. $+$ 3qt. = 6387qt. Ans.
30. 6387qt. $\div$ 4 = 1596gal. 3qt. ; 1596gal. $\div$ 54 = 29hhd.
 30gal. 3qt. Ans.
31. 15ch. $\times$ 36 = 540bu. ; 540bu. $+$ 16bu. = 556bu. ; 556bu.
 $\times$ 4 = 2224pk. ; 2224pk. $+$ 3pk. = 2227pk. ; 2227pk.
 $\times$ 8 = 17816qt. ; 17816qt. $\times$ 2 = 35632pt. Ans.
32. 35632pt. $\div$ 2 = 17816qt. ; 17816qt. $\div$ 8 = 2227pk. ;
 2227pk. $\div$ 4 = 556bu. 3pk. ; 556bu. $\div$ 36 = 15ch. 16bu.
 3pk. Ans.
33. 365da. $\times$ 24 = 8760h. ; 8760h. $+$ 6h. = 8766h. ; 8766h. $\times$
 60 = 525960m. ; 525960m. $\times$ 60 = 31557600sec. Ans.
34. 31557600sec. $\div$ 60 = 525960m. ; 525960m. $\div$ 60 =
 8766h. ; 8766h. $\div$ 24 = 365da. 6h. Ans.
35. 365da. $\times$ 24 = 8760h. ; 8760h. $+$ 6h. = 8766h. ; 8766h.
 $\times$ 1842 = 16146972h. Ans.
36. 16146972h. $\div$ 8766 = 1842 years, Ans.
37. 8S. $\times$ 30 = 240° ; 240° $+$ 14° = 254° ; 254° $\times$ 60 =
 15240' ; 15240' $+$ 18' = 15258' ; 15258' $\times$ 60 = 915480" ;
 915480" $+$ 17" = 915497" , Ans.
38. 915497" $\div$ 60 = 15258' 17" ; 15258' $\div$ 60 = 254° 18' ,
 254° $\div$ 30 = 8S. 14° 18' 17" , Ans.
39. 13 $\times$ 144 $\times$.02 $\frac{1}{2}$ = \$ 46.80, Ans.
40. 12 $\times$ 20 $\times$.20 = \$ 48.00, Ans.
41. 2hhd. $\times$ 63 $\times$ 4 = 504qt. ; 504qt. $+$ 3 = 168 bottles, Ans.
42. \$ 1480.00 $\div$ 25 = \$ 59.20 ; \$ 59.20 $\div$ 160 = \$ 0.37, cost
 of 1p. ; 37A. 2R. 18p. = 6018p. ; \$ 0.37 $\times$ 6018 =
 \$ 2226.66, Ans.
43. 5cwt. 3qr. 18lb. = 662lb. ; 662lb. $\times$ \$ 0.09 = \$ 59.58 ;

- $\$1.75 \times 25 = \$43.75$; $\$59.58 - \$43.75 = \$15.83$,
 Ans.
44. 2lb. 7oz. = 31oz.; $\$46.50 \div 31 = \$1.50$, price per oz.;
 $\$1.50 \times 12 = \$18.00$, price per pound, Ans.
45. 3T. 1cwt. 18lb. = 6850lb.; $6850\text{lb.} \times \$0.12 = \$822.00$,
 $6850\text{lb.} \times \$0.09 = \$616.50$; $\$822.00 - \$616.50 =$
 $\$205.50$, Ans.
46. 37m. 7fur. 29rd. = 12149rd.; $12149\text{rd.} \times \$5.75 =$
 $\$69856.75$, Ans.
47. 15m. 6fur. 37rd. = 5077rd.; $5077\text{rd.} \times \$17.29 =$
 $\$87,781.33$, Ans.
48. 40p. 200ft. = 11090ft.; $11090\text{ft.} \times \$1.50 = \$16,635$, Ans.
49. 18ft. $\times$ 15ft. = 270 sq. ft.; $270\text{ sq. ft.} \div 9 = 30\text{yd.}$ Ans.
50. 47da. $\times$ 10 = 470h.; $470\text{h.} + 7\text{h.} = 477\text{h.} = 28620\text{m.}$;
 $28620 \times 120 = 3434400$ nails, Ans.
51. 80rd. $\times$ 50rd. = 4000 sq. rd.; $4000\text{ sq. rd.} + 160 = 25$
 acres, Ans.
52. $18000000 + 90 = 200000\text{m.} = 138\text{da. } 21\text{h. } 20\text{m.}$ Ans.
53. $9 \times 15 \times 23 = 3105\text{yd.}$; $3105 \times \$0.08 = \$248.40$, Ans.
54. $6\text{m.} \times 4\frac{1}{2}\text{m.} = 27\text{ sq. m.}$; $27\text{ sq. m.} = 17280\text{A.}$; 17280
 $+ 90 = 192$ lots, Ans.
55. $196\text{d. } 49\text{m.} = 282289\text{m.}$; $282289 \times 47 = 13267583$ times,
 Ans.
56. $36\text{ft.} \times 16\text{ft.} = 576\text{ sq. ft.}$; $576\text{ sq. ft.} \times 2 = 1152\text{ sq. ft.}$
 $= 165888\text{in.}$; $165888\text{in.} + 27 = 6144$ shingles, Ans.
57. $110\text{m.} = 6969600\text{in.}$; $12\text{ft. } 6\text{in.} = 150\text{in.}$; $6969600 \div 150$
 $= 46464$ times, Ans.
58. $25 \times 7 \times 5 \times 12 \times 15 \times 178 = 28035000$; 28035000
 $\times \$4.84 = \$135689400$, Ans.
59. $18 \times 5\frac{1}{2} = 99\text{yd.}$; $99\text{yd.} + 5\text{yd.} = 104\text{yd.}$; $104\text{yd.} \times 3$
 $= 312\text{ft.}$; $312\text{ft.} + 2\text{ft.} = 314\text{ft.}$; $314\text{ft.} \times 12 = 3768\text{in.}$;
 $3768\text{in.} + 11\text{in.} = 3779\text{in.}$ Ans.
60. $3779\text{in.} + 12 = 314\text{ft. } 11\text{in.}$; $314\text{ft.} + 3 = 104\text{yd. } 2\text{ft.}$;
 $104\text{yd.} + 5\frac{1}{2} = 18\text{rd. } 5\text{yd. } 2\text{ft. } 11\text{in.}$ Ans.
61. 5T. 17cwt. 3qr. 18lb. = 13206lb.; $13206 \times \$0.03 =$
 $\$396.18$, Ans

62. $25\text{rd.} \times 16\text{rd.} = 400 \text{ sq. rd.} = 108900 \text{ sq. ft.}$; $108900 \times \$1.25 = \$136,125$; $\$136,125 - \$100,000 = \$36,125$,
Ans.

ADDITION OF COMPOUND NUMBERS.

(ART. 101, p. 111.)

3. $120\text{£. } 5\text{s. } 9\text{d. } 3\text{qr.}$

5. $191\text{lb. } 1\text{oz. } 19\text{dwt. } 15\text{gr.}$

7. $234\text{lb } 13 \text{ } 23 \text{ } 19 \text{ } 12\text{gr.}$

9. $102\text{T. } 1\text{cwt. } 3\text{qr. } 9\text{lb. } 15\text{oz.}$

10dr.

11. $189 \text{ E. E. } 0\text{qr. } 1\text{na. } 1\frac{1}{2}\text{in.}$

13. $74\text{m. } 3\text{fur. } 39\text{rd. } 2\frac{1}{2}\text{yd. } 2\text{ft. } 6\text{in.}$

$\frac{1}{2}\text{yd.} = 1\text{ft. } 6\text{in.}$

$74\text{m. } 3\text{fur. } 39\text{rd. } 3\text{yd. } 1\text{ft. } 0\text{in.}$

15. $179\text{m. } 0\text{fur. } 6\text{cha. } 3\text{p. } 18\text{li.}$

17. $162\text{A. } 0\text{R. } 2\text{p. } 17\frac{1}{2}\text{yd. } 4\text{ft. } 83\text{in.}$

$\frac{1}{2}\text{yd.} = 2\text{ft. } 36\text{in.}$

$162\text{A. } 0\text{R. } 2\text{p. } 17\text{yd. } 6\text{ft. } 119\text{in.}$

19. $213\text{C. } 110\text{ft. } 1455\text{in.}$

25. $211\text{ch. } 19\text{bu. } 3\text{pk. } 1\text{qt. } 1\text{pt.}$

21. $193\text{tun } 2\text{hhd. } 27\text{gal. } 2\text{qt. } 0\text{pt.}$

27. $256\text{w. } 4\text{da. } 3\text{h. } 39\text{m. } 19\text{s.}$

23. $211\text{tun } 0\text{hhd. } 53\text{gal. } 1\text{qt. } 1\text{pt.}$

29. $11\text{S. } 0^\circ \text{ } 30' \text{ } 21''.$

SUBTRACTION OF COMPOUND NUMBERS.

(ART. 102, p. 115.)

3. $51\text{£. } 18\text{s. } 10\text{d. } 2\text{qr.}$

5. $691\text{lb. } 9\text{oz. } 4\text{dwt. } 22\text{gr.}$

7. $63\text{lb } 11\frac{3}{4} \text{ } 13 \text{ } 19 \text{ } 19\text{gr.}$

9. $1\text{T. } 2\text{cwt. } 0\text{qr. } 27\text{lb. } 3\text{oz.}$

14qr.

11. $151 \text{ E. E. } 4\text{qr. } 2\text{na. } 1\frac{1}{2}\text{in.}$

13. $8\text{deg. } 59\frac{1}{2}\text{m. } 1\text{fur. } 39\text{rd. } 2\frac{1}{2}\text{ft. } 10\text{in.}$

$\frac{1}{2}\text{m.} = 4\text{fur. } \frac{1}{2}\text{ft.} = 6\text{in.}$

$8\text{deg. } 59\text{m. } 5\text{fur. } 39\text{rd. } 3\text{ft. } 4\text{in.}$

15. $13\text{m. } 5\text{fur. } 3\text{cha. } 1\text{p. } 21\text{li.}$

17. $41\text{A. } 1\text{R. } 38\text{p. } 18\frac{1}{2}\text{yd. } 8\text{ft. } 143\text{in.}$

$\frac{1}{2}\text{yd.} = 2\text{ft. } 36\text{in.}$

$41\text{A. } 1\text{R. } 38\text{p. } 19\text{yd. } 2\text{ft. } 35\text{in.}$

19. 371C. 126ft. 1683in.	23. 59 tun 2hhd. 42gal. 2qt. 1pt.
21. 61 tun 1hhd. 60gal. 1qt. 1pt. 2gi.	25. 53ch. 31bu. 1pk. 5qt. 0pt. 27. 4w. 1da. 9h. 26m. 27sec.

(ART. 103, p. 118.)

(2.)	(3.)	(4.)	(5.)
y. mo. da.	y. mo. da.	y. mo. da.	y. mo. da.
1847 0 6	1837 3 25	1848 1 23	1845 5 8
1843 2 21	1832 10 15	1767 6 11	1767 2 15
<u>3 9 15</u>	<u>4 5 10</u>	<u>80 7 12</u>	<u>78 2 23</u>

MISCELLANEOUS EXERCISES IN ADDITION AND SUBTRACTION OF COMPOUND NUMBERS.

(PAGE 119.)

(1.)	(2.)	(3.)
lb. oz. dwt. gr.	lb. $\frac{3}{4}$ 3 D gr.	T. cwt. qr. lb. oz.
4 8 13 8	7 3 2 2 1	17 11 3 11 12
5 11 19 23	2 10 0 1 13	11 17 1 19 11
8 0 17 15	2 3 7 2 17	53 19 1 17 8
18 9 14 10	<u>12 5 3 0 11</u>	27 19 3 18 9
<u>37 7 5 8</u>		16 3 3 0 13
		<u>127 12 1 12 5</u>

(4.)	(5.)	(6.)
£ s. d.	lb. oz. dwt. gr.	lb. $\frac{3}{4}$ 3 D gr.
7671 0 0	73 0 0 0	71 8 1 1 14
1728 17 9	26 11 13 14	<u>7 9 1 1 17</u>
<u>5942 2 3</u>	<u>46 0 6 10</u>	<u>63 10 7 2 17</u>

(7.)	(8.)	(9.)
T. cwt. qr. lb. oz.	yd. qr. na.	T. cwt. qr. lb.
28 13 0 0 0	37 3 3	2 13 1 17
10 17 0 19 14	18 1 3	3 0 0 27
<u>17 15 3 8 2</u>	<u>31 1 2</u>	<u>1 0 3 11</u>
	<u>87 3 0</u>	<u>6 14 1 27</u>

(10.)

m.	fur.	rd.	ft.	in.
16	7	18	14	11
19	1	13	16	9
97	3	27	13	3
47	5	37	13	10
181	2	18	8½	9
				½=6

181 2 18 9 3

NOTE. As 8½ feet and 9 inches are equal to 8 feet and 15 inches, so we find 8 feet 15 inches equal to 9 feet 3 inches.

(11.)

yd.	qr.	na.	m.	fur.	rd.	ft.	in.
76	0	0	20	0	0	0	0
18	3	2	3	4	18	13	8
57	0	2	16	3	21	2½	4
				½=6			
16	3	21	2	10			

NOTE. The half foot, which is 6 inches, is added to the 4 inches, and their sum is 10 inches.

(13.)

A.	R.	p.	ft.	in.
144	3	0	0	0
18	1	17	200	100
126	1	22	71½	44
				½=36
126	1	22	71	80

NOTE. The ½ of a foot, which is 36 inches, is added to the 44 inches, and their sum is 80 inches.

(14.)

cord.	ft.	in.
18	0	0
3	100	1000
14	27	728

(15.)

A.	R.	p.	ft.
169	3	15	227
187	1	15	165
217	2	28	165
574	3	20	12½

(16.)

cord.	ft.	in.
18	116	1000
17	111	1600
21	109	1716
58	82	860

(17.)

T.	ft.	in.
17	0	0
5	18	765
11	21	963

(18.)

gal.	qt.	pt.
169	0	0
76	3	1
92	0	1

(19.)

ch.	bu.	pk.	qt.
17	18	0	0
5	20	1	7
11	33	2	1

(20.)

y.	mo.	d.	h.	m.	s.
83	0	0	0	0	0
47	10	27	18	50	14
35	1	2	5	9	46

(21.)

s.	o.	"
11	15	36
5	18	50
5	26	45

(22.)

gal.	qt.	pt.
167	3	1
186	1	1
108	2	1
123	3	0
586	2	1

(23.)				(24.)			(25.)				
bu.	pk.	qt.	pt.	y.	mo.	d.	y.	d.	h.	m.	s.
17	1	7	1	13	4	13	18	345	13	37	15
18	3	2	0	12	11	23	87	169	12	16	28
19	1	3	1	18	9	29	316	144	20	53	18
51	3	0	1	45	2	5	13	360	21	57	15
107	1	5	1				436	290	20	44	16

(27.)				(28.)		
lb.	oz.	dwt.	gr.	yd.	qr.	na.
106	0	0	0	17	3	0
5	11	12	15	3	3	2
3	0	13	14	4	1	3
7	11	14	23	8	1	1
17	0	1	4	9	1	3
68	11	18	20			

(29.)				(30.)			
s.	o.	'	"	s.	o.	'	"
3	18	45	15	3	18	14	35
7	15	36	18	11	25	30	50
5	21	38	27	3	22	43	45
4	26	0	0				

NOTE. As this question is in Motion, it is necessary to reject the 12s in the sum of the signs.

NOTE. To perform this question, we add 12 signs to the longitude of the star, and, from their sum subtract the longitude of the planet, because all the planets move eastward, as seen from the sun.

MULTIPLICATION OF COMPOUND NUMBERS.

(ART. 106, p. 124.)

(3.)				(4.)			
m.	fur.	rd.		T.	cwt.	qr.	lb.
3	7	18	$\times 30 = 5 \times 6$	2	7	3	$18 \times 84 = 7 \times 12$
		5					7
19	5	10		16	15	1	14
		6					12
117	7	20		201	4	2	0

(5.)

yd.	qr.	na.	
7	3	2	$\times 72 = 6 \times 12$
		6	
47	1	0	
		12	
567	0	0	

(6.)

yd.	qr.	na.	
3	2	1	$\times 132 = 12 \times 11$
		12	
42	3	0	
		11	
470	1	0	

(ART. 107, p. 125.)

NOTE. It is sometimes more convenient to use as multipliers the nearest composite numbers than to follow the Rule.

(2.)	(3.)	(4.)
lb. oz. dr.	£. s. d.	m. fur. rd. yd. ft. in.
17 10 13 $\times 2$	2 17 9 $\frac{1}{2} \times 7$	17 3 19 3 2 7 $\times 8$
10	10	10
176 12 2	28 17 11	174 2 36 5 1 10
6	9	3
1060 8 12 = 60	260 1 3 = 90	523 0 30 5 2 6 = 30
35 5 10 = 2	20 4 6 $\frac{1}{2}$ = 7	139 3 37 2 $\frac{1}{2}$ 2 8 = 8
1095 14 6 = 62	280 5 9 $\frac{1}{2}$ = 97	662 4 28 3 2 2 = 38

(5.)

bu.	pk.	qt.	pt.	
27	3	6	1	$\times 8$
			10	
279	2	1	0	
			9	
2515	3	1	0 = 90	
223	2	4	0 = 8	
2739	1	5	0 = 98	

(6.)

yd.	qr.	na.	
7	3	2	$\times 7$
		10	
78	3	0	$\times 4$
		10	
787	2	0	
		3	
2362	2	0 = 300	
315	0	0 = 40	
55	0	2 = 7	
2732	2	2 = 347	

(7.)							(8.)					
A.	B.	P.	yd.	ft.	in.		T.	cwt.	qr.	lb.	oz.	
13	3	14	18	7	76	$\times 1$	17	14	3	18	14	$\times 1$
					9						10	
124	2	11	17 $\frac{1}{2}$	4	108		177	9	0	20	12	$\times 5$
					2						10	
249	0	23	6 $\frac{1}{2}$	0	72	= 18	1774	11	3	11	8	
13	3	14	18	7	76	= 1					4	
262	3	37	24 $\frac{1}{2}$	8	4	= 19	7098	7	1	18	0	= 400
			$\frac{1}{2}$	= 2	36		887	5	3	19	12	= 50
262	3	37	25	1	40	= 19	17	14	3	18	14	= 1
							8003	8	1	0	10	= 451

DIVISION OF COMPOUND NUMBERS.

(ART. 110, p. 127.)

(2.)				(3.)				(4.)			
f.	s.	d.		m.	fur.	rd.		T.	cwt.	qr.	lb.
6)6409	10	0		5)117	7	20		12)201	4	2	0
6)1068	5	0		6)23	4	28		7)16	15	1	14
10)178	0	10		3	7	18		2	7	3	18
17	16	1									

(5.)				(6.)			
yd.	qr.	na.		yd.	qr.	na.	
6)567	0	0		12)470	1	0	
12)94	2	0		11)39	0	3	
7	3	2		3	2	1	

(7.)

A. R. p. yd. ft. in.
 19)262 3 37 25 1 40(13A.

19

72

57

15

4

19)63(3R.

57

6

40

19)277(14p.

19

87

76

11

30 $\frac{1}{2}$

355

2 $\frac{1}{2}$

19)357 $\frac{1}{2}$ (18yd.

19

167

152

15 $\frac{1}{2}$

9

19)142 $\frac{1}{2}$ (7ft.

133

9 $\frac{3}{4}$

144

36

36

940

108

1444

(Carried up.)

(8.)

f. cwt. qr. lb. oz.
 451)8003 8 1 0 10(17T.

451

3493

3157

336

20

451)6728(14cwt.

451

2218

1804

414

4

451)1657(3qr.

1353

304

28

451)8512(18lb.

451

4002

3608

394

16

451)6314(14oz.

451

1804

1804

(Brought up.)

19)1444(76in.

133

114

114

MISCELLANEOUS EXAMPLES IN MULTIPLICATION
AND DIVISION OF COMPOUND NUMBERS.

(ART. 111, p. 129.)

(1.)

cwt.	qr.	lb.
8	3	20
		5
44	2	16
		6
267	3	12
67	3	12
200	0	0

£	s.	d.
1	17	6
		10
18	15	0
		10
187	10	0
		2
375	0	0

Ans.

(2.)

A.	R.	p.
12)11067	1	8
12)922	1	4
	76	3 17
	4	
	307R.	
	40	
	12297p.	

£	s.	d.
0	1	9½ × 7.
		10
0	17	11 × 9
		10
8	19	2 × 2
		10
89	11	8 × 2
		10

(3.)

m.	fur.	rd.
18	7	32
		10
189	6	0
		10
1897	4	0

m.	fur.	rd.
2644	3	12
1897	4	0
746	7	12

Ans.

Ans.

895	16	8 = 10000
179	3	4 = 2000
17	18	4 = 200
8	1	3 = 90
12	6½	= 7
1101	12	1½ = 12297

(4.)

y.
1807
1798
9y.

d.
365
9
3285d.

h.	m.
11	19 P. M.
3	17 A. M.
20	2

1 add for leap year.
67 " from July 4 to
3353 days. [Sept. 9.

Ans. 3353d. 20h. 2m.

(5.)

$$3124\text{rd.} \times 8 = 24992\text{rd.} = 78\text{m. } 0\text{fur. } 32\text{rd.}$$

m.	fur.	rd
121	5	0
78	0	32

Ans. 43 4 8

(6.)

cwt.	qr.	lb.
7	3	18
		16
126	2	8 = 14176lb.
71	0	22
55	1	14 = 6202lb.

$$7974 \times 6 = \$478.44$$

$$6202 \times 7 = 434.14$$

$$\underline{\$912.58}$$

$$14176 \times 5 = 708.80$$

Ans. \$203.78

cwt.	qr.	lb.
7	3	18
		9
71	0	22 = 7974lb.

(7.)

£.	s.	d.	£.	s.	d.
17	18	10	1	17	6
		17			144

305	0	2	270	0	0
207	0	0			

35 0 2 Ans.

(8.)

m.	fur.	rd.	m.	fur.	rd.
17	4	30	12	3	20
		10			10
175	7	20	124	3	0
124	3	0			
51	4	20			
50					

1 4 20 Ans.

(9.)

$$\begin{aligned} \$5.75 \times 760 &= \$4370; \\ \$4370 \div .02 &= 218500\text{lb.}; \\ 218500\text{lb.} \div 2 &= 109250\text{lb.}; \\ 109250\text{lb.} &= 48\text{T. } 15\text{cwt. } 1\text{qr. } \\ &22\text{lb. Ans.} \end{aligned}$$

(10.)

A.	R.	p.	ft.
0	0	44	200
			17
4	3	0.	133
2	2	0	240
2	0	39	165½

A.	R.	p.	ft.
2	0	39	165½ = 97903ft.

1s. 2½d. $\times$ 97903 = 5914£. 19s. 5½d. Ans.

(11.)

$$100 \times 100 = 10000 \text{ sq. rd.} \quad 3563 \times \$ 1.75 = \$ 6235.25 \text{ Ans.}$$

$$5A. 3R. 17p. = 937$$

$$50 \times 50 = 2500$$

$$3000$$

$$\underline{6437}$$

$$3563 \text{ sq. rd.}$$

CANCELLATION.

(ART. 115, p. 132.)

$$3. \frac{\cancel{2}7 \times 16}{\cancel{2}7} = 16.$$

$$4. \frac{42 \times \cancel{1}9}{\cancel{1}9} = 42.$$

$$5. \frac{\begin{smallmatrix} 2 \\ \cancel{3} \times \cancel{6} \times \cancel{3} \end{smallmatrix}}{\cancel{6} \times \cancel{3} \times \cancel{4}} = 2.$$

$$6. \frac{\cancel{1}7 \times \cancel{6} \times \cancel{2}}{\cancel{6} \times \cancel{2} \times \cancel{1}7} = 1.$$

$$7. \frac{\cancel{1}5 \times \cancel{3}0 \times \cancel{1}0}{\cancel{1}0 \times \cancel{1}5} = 30.$$

(ART. 116, p. 133.)

$$10. \frac{\begin{smallmatrix} \cancel{3} & \cancel{2} & \cancel{2} \\ \cancel{9} \times \cancel{3} \times \cancel{2} \times \cancel{1}4 \end{smallmatrix}}{\begin{smallmatrix} \cancel{3} & \cancel{4} & \cancel{6} & \cancel{7} \end{smallmatrix}} = 4.$$

$$11. \frac{\begin{smallmatrix} \cancel{2} & & \cancel{5} & \cancel{3} \\ \cancel{1}6 \times \cancel{5} \times \cancel{1}0 \times \cancel{1}8 \end{smallmatrix}}{\begin{smallmatrix} \cancel{8} \times \cancel{6} \times \cancel{2} \times \cancel{1}2 \end{smallmatrix}} = \frac{2}{2} [= 12\frac{1}{2}].$$

$$12. \frac{\begin{smallmatrix} \cancel{2} & \cancel{3} & \cancel{2} \\ \cancel{2}2 \times \cancel{9} \times \cancel{1}2 \times \cancel{5} \end{smallmatrix}}{\begin{smallmatrix} \cancel{3} \times \cancel{1}1 \times \cancel{6} \times \cancel{4} \end{smallmatrix}} = 15.$$

$$13. \frac{\begin{smallmatrix} \cancel{5} & & \cancel{2} & \cancel{9} \\ \cancel{2}5 \times \cancel{7} \times \cancel{1}4 \times \cancel{3}6 \end{smallmatrix}}{\begin{smallmatrix} \cancel{4} \times \cancel{1}0 \times \cancel{2}1 \times \cancel{5}4 \end{smallmatrix}} = \frac{11}{6} [= 1\frac{5}{6}].$$

$$14. \frac{\begin{smallmatrix} \cancel{2} & \cancel{3} & \cancel{9} & \cancel{2} \\ \cancel{2}6 \times \cancel{7}2 \times \cancel{8}1 \times \cancel{1}2 \end{smallmatrix}}{\begin{smallmatrix} \cancel{3}6 \times \cancel{1}8 \times \cancel{2}4 \times \cancel{5}4 \end{smallmatrix}} = 3.$$

(ART. 117, p. 134.)

$$16. \frac{\begin{smallmatrix} \cancel{2} \\ \cancel{3} \times \cancel{4} \times \cancel{9} \times \cancel{2} \times \cancel{1}2 \times \cancel{1}6 \times \cancel{5} \end{smallmatrix}}{\begin{smallmatrix} \cancel{1} \times \cancel{6} \times \cancel{6} \times \cancel{3} \times \cancel{3} \times \cancel{4} \times \cancel{2}0 \end{smallmatrix}} = 2.$$

$$17. \frac{\begin{smallmatrix} \cancel{8} & & \cancel{7} \\ \cancel{6} \times \cancel{1}5 \times \cancel{1}6 \times \cancel{2}4 \times \cancel{1}2 \times \cancel{2}1 \times \cancel{2}7 \end{smallmatrix}}{\begin{smallmatrix} \cancel{2} \times \cancel{1}0 \times \cancel{9} \times \cancel{8} \times \cancel{3}6 \times \cancel{7} \times \cancel{3}1 \end{smallmatrix}} = 8.$$

PROPERTIES AND RELATIONS OF NUMBERS.

2. (ART. 122, p. 136.)	3	5.	7
3.	2 or 4	6.	4
4.	4		
2. (ART. 124, p. 137.)	5	7.	4
3.	24	8.	12
4.	1	9.	2
5.	2	10.	6
6.	6		

(ART. 128, p. 139.)

2. $\begin{array}{r} 2 \overline{) 8 \ 4 \ 8 \ 6} \\ \underline{4 3} \end{array}$	6. $\begin{array}{r} 6 \overline{) 9 \ 8 \ 12 \ 18 \ 24} \\ \underline{ 3 4} \end{array}$
$2 \times 4 \times 3 = 24$ Ans.	$6 \times 3 \times 4 = 72$ Ans.
3. $\begin{array}{r} 7 \overline{) 7 \ 14 \ 21 \ 15} \\ \underline{ 2 8 \ 15} \end{array}$	7. $\begin{array}{r} 2 \overline{) 10 \ 12 \ 16 \ 18 \ 20} \\ \underline{2 6 8 9 10} \\ 3 \overline{) 3 4 9 5} \\ \underline{ 1 4 3 5} \end{array}$
$7 \times 2 \times 15 = 210$ Ans.	$2 \times 2 \times 3 \times 4 \times 3 \times 5 = 720$
4. $\begin{array}{r} 2 \overline{) 2 \ 4 \ 5 \ 6 \ 7 \ 8} \\ \underline{ 5 3 7 4} \end{array}$	[Ans.]
$2 \times 5 \times 3 \times 7 \times 4 = 840$ Ans.	
5. $\begin{array}{r} 4 \overline{) 10 \ 12 \ 16 \ 20 \ 24} \\ \underline{ 2 4 5 6} \\ 2 5 3 \end{array}$	
$4 \times 2 \times 2 \times 5 \times 3 = 240$ Ans.	

VULGAR FRACTIONS.

2. (ART. 135, p. 142.)	$\frac{1}{2}$	7.	$\frac{123}{1000}$
3.	$\frac{2}{3}$	8.	$\frac{1}{2}$
4.	$\frac{1}{3}$	9.	$\frac{7891}{10000}$
5.	$\frac{2}{3}$	10.	$\frac{178}{1000}$
6.	$\frac{1}{2}$		

2. (ART. 136, p. 143.)	$\frac{5^2}{7}$	10.	$\frac{360}{13}$
3.	$\frac{1^3}{4}$	11.	$\frac{12322}{11}$
4.	$\frac{10^2}{11}$	12.	$\frac{125}{1}$
5.	$\frac{81}{11}$	13.	$\frac{150}{1}$
6.	$\frac{187}{12}$	14.	$\frac{275}{8}$
7.	$\frac{162}{8}$	15.	$\frac{243}{1}$
8.	$\frac{18842}{117}$	16.	$\frac{1262}{15}$
9.	$\frac{5142}{117}$		
2. (ART. 137, p. 144.)	12	7.	1
3.	$10\frac{2}{17}$	8.	567
4.	$10\frac{1}{11}$	9.	$9\frac{2}{3}$
5.	$18\frac{2}{8}$	10.	$4\frac{1}{13}$
6.	142 $\frac{2}{7}$		

(ART. 138, p. 145.)	
3. $\frac{2}{3} \times \frac{4}{5} \times \frac{6}{7} = \frac{48}{105}$ Ans.	9. $\frac{3}{7} \times \frac{4}{11} \times \frac{7}{9} \times \frac{8}{10} \times \frac{13}{3} = 5 \frac{13}{15}$ Ans.
4. $\frac{7}{8} \times \frac{9}{11} \times \frac{7}{1} = \frac{441}{88} = 5\frac{1}{8}$ [Ans.]	10. $\frac{15}{16} \times \frac{8}{9} \times \frac{7}{11} = \frac{35}{22}$ Ans.
5. $\frac{7}{8} \times \frac{9}{11} \times \frac{3}{8} \times \frac{4}{7} = \frac{27}{176}$ Ans.	11. $\frac{8}{11} \times \frac{22}{35} \times \frac{15}{22} \times \frac{77}{8} = 3$ [Ans.]
6. $\frac{11}{17} \times \frac{1}{2} \times \frac{3}{4} \times \frac{1}{20} \times \frac{7}{1} = \frac{331}{2720}$ [Ans.]	12. $\frac{5}{7} \times \frac{3}{15} \times \frac{4}{16} \times \frac{35}{4} \times \frac{11}{5} = \frac{11}{1}$ Ans.
7. $\frac{3}{5} \times \frac{4}{11} \times \frac{11}{17} \times \frac{17}{23} \times \frac{23}{4} = \frac{3}{5}$ [Ans.]	
8. $\frac{1}{5} \times \frac{8}{9} \times \frac{9}{11} \times \frac{5}{8} \times \frac{3}{7} = \frac{3}{77}$ [Ans.]	

(ART. 140, p. 147.)

2. $3 \times 6 = 18 = \frac{18}{1} = \frac{9}{\frac{1}{2}}$	3. $7 \times 5 \times 2 = 70 = \frac{70}{1}$
$5 \times 4 = 20 = \frac{20}{1} = \frac{10}{\frac{1}{2}}$	$4 \times 9 \times 2 = 72 = \frac{72}{1}$
$4 \times 6 = 24$	$1 \times 9 \times 5 = 45 = \frac{45}{1}$
	$9 \times 5 \times 2 = 90$

$$\begin{array}{r}
 4. \quad 4 \times 8 \times 11 = 352 = \frac{352}{11} \\
 \quad 3 \times 7 \times 11 = 231 = \frac{231}{11} \\
 \quad 5 \times 7 \times 8 = 280 = \frac{280}{8} \\
 \quad 7 \times 8 \times 11 = 616
 \end{array}$$

$$\begin{array}{r}
 5. \quad 8 \times 12 \times 3 = 288 = \frac{288}{3} \\
 \quad 5 \times 9 \times 3 = 135 = \frac{135}{3} \\
 \quad 2 \times 9 \times 12 = 216 = \frac{216}{3} \\
 \quad 9 \times 12 \times 3 = 324
 \end{array}$$

$$\begin{array}{r}
 6. \quad 1 \times 5 \times 8 \times 4 = 160 = \frac{160}{4} \\
 \quad 2 \times 6 \times 8 \times 4 = 384 = \frac{384}{4} \\
 \quad 7 \times 6 \times 5 \times 4 = 840 = \frac{840}{4} \\
 \quad 1 \times 6 \times 5 \times 8 = 240 = \frac{240}{4} \\
 \quad 6 \times 5 \times 8 \times 4 = 960
 \end{array}$$

(ART. 141, p. 150.)

(2.)

$$\begin{array}{r}
 \frac{2}{2}, \frac{4}{4}, \frac{6}{6}, \frac{8}{8} \\
 2) 4 \ 5 \ 6 \ 8 \\
 2) 2 \ 5 \ 3 \ 4 \\
 \quad 1 \ 5 \ 3 \ 2 \\
 2 \times 2 \times 5 \times 3 \times 2 = 120 \\
 \quad 120 \\
 \begin{array}{l}
 4 \mid 30 \times 3 = 90 \\
 5 \mid 24 \times 4 = 96 \\
 6 \mid 20 \times 5 = 100 \\
 8 \mid 15 \times 7 = 105
 \end{array}
 \end{array}$$

$$\frac{20}{120}, \frac{24}{120}, \frac{100}{120}, \frac{105}{120} \text{ Ans.}$$

(4.)

$$\begin{array}{r}
 \frac{7}{7}, \frac{9}{9}, \frac{10}{10}, \frac{31}{31} \\
 4) 8 \ 10 \ 4 \\
 2) 2 \ 10 \ 1 \\
 \quad 1 \ 5 \ 1
 \end{array}$$

$$4 \times 2 \times 5 = 40$$

$$\begin{array}{r}
 \quad 40 \\
 8 \mid 5 \times 7 = 35 \\
 10 \mid 4 \times 9 = 36 \\
 4 \mid 10 \times 31 = 310
 \end{array}$$

$$\frac{35}{40}, \frac{36}{40}, \frac{310}{40} \text{ Ans.}$$

(3.)

$$\begin{array}{r}
 \frac{2}{2}, \frac{2}{2}, \frac{6}{6}, \frac{11}{11} \\
 4 \times 5 \times 9 \times 11 = 1980 \\
 \begin{array}{r}
 1980 \\
 4 \mid 495 \times 3 = 1485 \\
 5 \mid 396 \times 2 = 792 \\
 9 \mid 220 \times 4 = 880 \\
 11 \mid 180 \times 2 = 360 \\
 1485, 792, 880, 360 \text{ Ans.}
 \end{array}
 \end{array}$$

(5.)

$$\begin{array}{r}
 \frac{7}{7}, \frac{9}{9}, \frac{11}{11}, \frac{28}{28} \\
 7) 7 \ 14 \ 28 \ 7 \\
 2) 1 \ 2 \ 4 \ 1 \\
 \quad 1 \ 1 \ 2 \ 1 \\
 7 \times 2 \times 2 = 28
 \end{array}$$

$$\begin{array}{r}
 \quad 28 \\
 7 \mid 4 \times 3 = 12 \\
 14 \mid 2 \times 9 = 18 \\
 28 \mid 1 \times 11 = 11 \\
 7 \mid 4 \times 38 = 152
 \end{array}$$

$$\frac{12}{28}, \frac{18}{28}, \frac{11}{28}, \frac{152}{28} \text{ Ans.}$$

(6.)

$$\begin{array}{r} \frac{1}{2}, \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{5}{10}, \frac{6}{12} \\ 2) 2 \ 4 \ 6 \ 8 \ 10 \ 12 \\ 3) 1 \ 2 \ 3 \ 4 \ 5 \ 6 \\ 2) 1 \ 2 \ 1 \ 4 \ 4 \ 2 \\ 2) 1 \ 1 \ 1 \ 2 \ 2 \ 1 \\ \hline 1 \ 1 \ 1 \end{array}$$

$$2 \times 3 \times 2 \times 2 = 24$$

$$\begin{array}{r|l} 24 & \\ 2 & 12 \times 1 = 12 \\ 4 & 6 \times 3 = 18 \\ 6 & 4 \times 5 = 20 \\ 8 & 3 \times 5 = 15 \\ 12 & 2 \times 5 = 10 \end{array}$$

$$\frac{12}{24}, \frac{12}{24}, \frac{24}{24}, \frac{12}{24}, \frac{24}{24}, \frac{12}{24} \text{ Ans.}$$

(7.)

$$\begin{array}{r} \frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}, \frac{5}{15}, \frac{6}{18} \\ 3) 9 \ 3 \ 3 \ 4 \ 6 \ 12 \\ 2) 3 \ 1 \ 1 \ 4 \ 2 \ 4 \\ 2) 3 \ 1 \ 1 \ 2 \ 1 \ 2 \\ \hline 3 \ 1 \ 1 \ 1 \ 1 \ 1 \\ 3 \times 2 \times 2 \times 3 = 36 \end{array}$$

$$\begin{array}{r|l} 36 & \\ 9 & 4 \times 4 = 16 \\ 3 & 12 \times 2 = 24 \\ 3 & 12 \times 1 = 12 \\ 4 & 9 \times 1 = 9 \\ 6 & 6 \times 1 = 6 \\ 12 & 3 \times 1 = 3 \end{array}$$

$$\frac{16}{36}, \frac{24}{36}, \frac{12}{36}, \frac{9}{36}, \frac{6}{36}, \frac{3}{36} \text{ Ans.}$$

(8.)

$$\begin{array}{r} \frac{1}{3}, \frac{2}{6}, \frac{3}{9} \\ 3) 6 \ 9 \ 12 \\ 2) 2 \ 3 \ 4 \\ \hline 1 \ 3 \ 2 \\ 3 \times 2 \times 3 \times 2 = 36 \\ \hline 36 \\ 6 & 6 \times 5 = 30 \\ 9 & 4 \times 4 = 16 \\ 12 & 3 \times 7 = 21 \end{array}$$

$$\frac{30}{36}, \frac{16}{36}, \frac{21}{36} \text{ Ans.}$$

(9.)

$$\frac{7}{11}, \frac{5}{11}, 7, 8 = \frac{21}{11}, \frac{44}{11}, 7, 8$$

$$4 \times 11 = 44$$

$$\begin{array}{r|l} 44 & \\ 4 & 11 \times 31 = 341 \\ 11 & 4 \times 61 = 244 \\ 1 & 44 \times 7 = 308 \\ 1 & 44 \times 8 = 352 \end{array}$$

$$\frac{341}{44}, \frac{244}{44}, \frac{308}{44}, \frac{352}{44} \text{ Ans.}$$

(10.)

$$\frac{1}{4}, 4, 5, 7, 9 = \frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}$$

$$\begin{array}{r|l} 4 & \\ 4 & 1 \times 3 = 3 \\ 1 & 4 \times 4 = 16 \\ 1 & 4 \times 5 = 20 \\ 1 & 4 \times 7 = 28 \\ 1 & 4 \times 9 = 36 \end{array}$$

$$\frac{3}{4}, \frac{16}{4}, \frac{20}{4}, \frac{28}{4}, \frac{36}{4} \text{ Ans.}$$

2. (ART. 143, p. 149.) $3\overline{11} \mid 5.$

3. $2\overline{17} \mid 6.$

4. $2\overline{25} \mid 7.$

$2\overline{11}$

$1\overline{11}$

$1\overline{11}$

(ART. 144, p. 149.)

(2.)

$4 \overline{) 8 \ 12 \ 16}$

$2 \overline{) 2 \ 3 \ 4}$

$1 \ 3 \ 2$

$4 \times 2 \times 3 \times 2 = 48$

$$\begin{array}{r} 48 \\ 8 \overline{) 6 \times 5 = 30} \\ 12 \overline{) 4 \times 11 = 44} \\ 16 \overline{) 3 \times 13 = 39} \end{array}$$

$\frac{113}{48} = 2\overline{17} \text{ Ans.}$

(4.)

$21 \times 37 = 777$

$$\begin{array}{r} 777 \\ 21 \overline{) 37 \times 19 = 703} \\ 37 \overline{) 21 \times 31 = 651} \\ \hline 1354 \\ 777 \overline{) 1354} = 1\overline{77} \end{array}$$

[Ans.]

(3.)

$2 \overline{) 20 \ 18 \ 14}$

$10 \ 9 \ 7$

$2 \times 10 \times 9 \times 7 = 1260$

$$\begin{array}{r} 1260 \\ 20 \overline{) 63 \times 9 = 567} \\ 18 \overline{) 70 \times 11 = 770} \\ 14 \overline{) 90 \times 5 = 450} \end{array}$$

$$\frac{1787}{1260} = 1\overline{427},$$

[Ans.]

(5.)

$4 \overline{) 4 \ 6 \ 8 \ 12}$

$3 \overline{) 1 \ 6 \ 2 \ 3}$

$2 \overline{) 1 \ 2 \ 2 \ 1}$

$1 \ 1 \ 1 \ 1$

$4 \times 2 \times 3 = 24$

$$\begin{array}{r} 24 \\ 4 \overline{) 6 \times 3 = 18} \\ 6 \overline{) 4 \times 5 = 20} \\ 8 \overline{) 3 \times 3 = 9} \\ 12 \overline{) 2 \times 1 = 2} \end{array}$$

$$\frac{49}{24} = 2\overline{1} \text{ Ans.}$$

(6.)

$3 \overline{) 9 \ 21 \ 24 \ 2}$

$2 \overline{) 3 \ 7 \ 8 \ 2}$

$3 \ 7 \ 4 \ 1$

$3 \times 2 \times 3 \times 7 \times 4 = 504$

$$\begin{array}{r} 504 \\ 9 \overline{) 56 \times 4 = 224} \\ 21 \overline{) 24 \times 8 = 192} \\ 24 \overline{) 21 \times 11 = 231} \\ 2 \overline{) 252 \times 1 = 252} \end{array}$$

$$\frac{899}{504} = 1\overline{781},$$

[Ans.]

(7.)

$$\begin{array}{r} 12) 72 \quad 84 \quad 96 \\ 2) 6 \quad 7 \quad 8 \\ \hline 3 \quad 7 \quad 4 \end{array}$$

$$12 \times 2 \times 3 \times 7 \times 4 = 2016$$

$$\begin{array}{r} 2016 \\ 72 \mid 28 \times 19 = 532 \\ 84 \mid 24 \times 51 = 1224 \\ 96 \mid 21 \times 71 = 1491 \end{array}$$

$$\begin{array}{r} 3247 \\ 2016 = 11231, \\ \text{[Ans.]} \end{array}$$

(8.)

$$\begin{array}{r} 25) 25 \quad 50 \quad 75 \quad 100 \\ 2) 1 \quad 2 \quad 3 \quad 4 \\ \hline 1 \quad 1 \quad 3 \quad 2 \end{array}$$

$$25 \times 2 \times 3 \times 2 = 300$$

$$\begin{array}{r} 300 \\ 25 \mid 12 \times 3 = 36 \\ 50 \mid 6 \times 49 = 294 \\ 75 \mid 4 \times 74 = 296 \\ 100 \mid 3 \times 81 = 243 \end{array}$$

$$\begin{array}{r} 869 \\ 300 = 2898, \\ \text{[Ans.]} \end{array}$$

(9.)

$$\begin{array}{r} 2) 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \\ 2) 1 \quad 3 \quad 2 \quad 5 \quad 3 \quad 7 \quad 4 \\ 3) 1 \quad 3 \quad 1 \quad 5 \quad 3 \quad 7 \quad 2 \\ \hline 1 \quad 1 \quad 1 \quad 5 \quad 1 \quad 7 \quad 2 \end{array}$$

$$2 \times 2 \times 3 \times 5 \times 7 \times 2 = 840$$

$$\begin{array}{r} 840 \\ 2 \mid 420 \times 1 = 420 \\ 3 \mid 280 \times 2 = 560 \\ 4 \mid 210 \times 3 = 630 \\ 5 \mid 168 \times 4 = 672 \\ 6 \mid 140 \times 5 = 700 \\ 7 \mid 120 \times 6 = 720 \\ 8 \mid 105 \times 7 = 735 \end{array}$$

$$\begin{array}{r} 4437 \\ 840 = 5278 \text{ Ans.} \end{array}$$

(10.)

$$\begin{array}{r} 3) 9 \quad 10 \quad 11 \quad 12 \quad 13 \quad 14 \quad 15 \\ 2) 3 \quad 10 \quad 11 \quad 4 \quad 13 \quad 14 \quad 5 \\ 5) 3 \quad 5 \quad 11 \quad 2 \quad 13 \quad 7 \quad 5 \\ \hline 3 \quad 1 \quad 11 \quad 2 \quad 13 \quad 7 \quad 1 \end{array}$$

$$3 \times 2 \times 5 \times 3 \times 11 \times 2 \times 13 \times 7 = 180180$$

$$\begin{array}{r} 180180 \\ 9 \mid 20020 \times 8 = 160160 \\ 10 \mid 18018 \times 9 = 162162 \\ 11 \mid 16380 \times 10 = 163800 \\ 12 \mid 15015 \times 11 = 165165 \\ 13 \mid 13860 \times 12 = 166320 \\ 14 \mid 12870 \times 13 = 167310 \\ 15 \mid 12012 \times 14 = 168168 \end{array}$$

$$1158085$$

$$\begin{array}{r} 1158085 \\ 180180 = 642498 \text{ Ans.} \end{array}$$

(11.)

$$\frac{3}{4} \times \frac{2}{3} = \frac{1}{2} = \frac{1}{2}$$

$$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$2) 2 \quad 48$$

$$1 \quad 24$$

$$2 \times 24 = 48$$

$$\begin{array}{r} 48 \\ 2 \mid 24 \times 1 = 24 \\ 48 \mid 1 \times 35 = 35 \end{array}$$

$$\begin{array}{r} 59 \\ 48 = 111 \text{ Ans.} \end{array}$$

(12.)

$$\frac{2}{3} \times \frac{1}{5} = \frac{2}{15}; \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

$$\begin{array}{r} 8 \overline{) 32 \ 24} \\ \underline{4 \ 3} \end{array}$$

$$8 \times 4 \times 3 = 96$$

$$\begin{array}{r} 32 \overline{) 96} \\ 24 \overline{) 3 \times 21 = 63} \\ \underline{4 \times 11 = 44} \end{array}$$

$$\frac{107}{96} = 1\frac{11}{96} \text{ Ans.}$$

(13.)

$$\frac{1}{3} \times \frac{2}{3} = \frac{2}{9}; \frac{1}{5} \times \frac{7}{10} = \frac{7}{50}$$

$$27 \times 50 = 1350$$

$$\begin{array}{r} 27 \overline{) 1350} \\ 50 \times 2 = 100 \\ 27 \times 7 = 189 \\ \underline{289} \\ 1350 \text{ Ans.} \end{array}$$

(14.)

$$\frac{2}{3} \times \frac{3}{4} \times \frac{4}{5} = \frac{2}{5}$$

$$\frac{5}{6} \times \frac{6}{7} \times \frac{7}{10} = \frac{5}{10} = \frac{1}{2}$$

$$2 \times 5 = 10$$

$$\begin{array}{r} 5 \overline{) 10} \\ 2 \overline{) 2 \times 2 = 4} \\ \underline{5 \times 1 = 5} \\ 9 \\ 10 \text{ Ans.} \end{array}$$

(16.)

$$3\frac{2}{3} = 4\frac{1}{3}; 4\frac{1}{2} = 4\frac{1}{2}$$

$$\begin{array}{r} 7 \overline{) 7 \ 14} \\ \underline{1 \ 2} \end{array}$$

$$7 \times 2 = 14$$

$$\begin{array}{r} 7 \overline{) 14} \\ 14 \overline{) 2 \times 24 = 48} \\ \underline{1 \times 67 = 67} \\ 115 \\ 14 \text{ Ans.} \end{array}$$

(15.)

$$\frac{1}{3} \times \frac{3}{11} \times \frac{11}{12} = \frac{1}{12}$$

$$\frac{1}{2} \times \frac{2}{9} = \frac{1}{9}$$

$$\begin{array}{r} 3 \overline{) 12 \ 9} \\ \underline{4 \ 3} \end{array}$$

$$3 \times 4 \times 3 = 36$$

$$\begin{array}{r} 12 \overline{) 36} \\ 9 \overline{) 3 \times 1 = 3} \\ \underline{4 \times 1 = 4} \\ 7 \\ 36 \text{ Ans.} \end{array}$$

(17.)

$$4\frac{2}{3} = 4\frac{2}{3}; 5\frac{1}{2} = 5\frac{1}{2}$$

$$4 \times 7 = 28$$

$$\begin{array}{r} 4 \overline{) 28} \\ 7 \overline{) 7 \times 19 = 133} \\ 7 \overline{) 4 \times 41 = 164} \\ 297 \\ 28 \text{ Ans.} \end{array}$$

$$\begin{array}{rcl}
 17\frac{1}{2} = \frac{71}{4} & 18\frac{1}{2} = \frac{221}{12} & (18.) \\
 \begin{array}{r} 4 \overline{) 4 \ 12} \\ 1 \ 3 \end{array} & \begin{array}{r} 4 \overline{) 12} \\ 12 \end{array} & \begin{array}{r} 3 \times 71 = 213 \\ 1 \times 221 = 221 \\ \hline 434 \end{array} \\
 4 \times 3 = 12 & & \frac{434}{12} = 36\frac{1}{3} \text{ Ans.} \\
 2. (\text{ART. 147, p. 151.}) & \frac{1}{17} \overline{) 4.} & \frac{23}{11} \overline{) 6.} \quad \frac{232}{10} \overline{) 8.} \quad \frac{1}{4} \\
 3. & \frac{1}{18} \overline{) 5.} & \frac{111}{11} \overline{) 7.} \quad \frac{1}{10} \overline{) 8.}
 \end{array}$$

SUBTRACTION OF VULGAR FRACTIONS.

$$\begin{array}{rcl}
 (2.) & (\text{ART. 148, p. 152.}) & (5.) \\
 \frac{7}{8} - \frac{1}{4} & 3 \overline{) 18 \ 21} & \frac{11}{12} - \frac{1}{6} \quad 2 \overline{) 34 \ 10} \\
 3 \times 6 \times 7 = 126 & 6 \ 7 & 2 \times 17 \times 5 = 170 \quad 17 \ 5 \\
 \begin{array}{r} 126 \\ 18 \overline{) 7 \times 7 = 49} \\ 21 \overline{) 6 \times 4 = 24} \\ \hline 25 \end{array} & & \begin{array}{r} 170 \\ 34 \overline{) 5 \times 11 = 55} \\ 10 \overline{) 17 \times 1 = 17} \\ \hline 38 \end{array} \\
 \frac{25}{126} \text{ Ans.} & & \frac{38}{170} = \frac{19}{85} \text{ Ans.} \\
 (3.) & 4 \overline{) 20 \ 16} & (6.) \\
 \frac{13}{8} - \frac{1}{4} & 5 \ 4 & \frac{31}{8} - \frac{3}{8} \quad 4 \overline{) 36 \ 16} \\
 4 \times 5 \times 4 = 80 & & 4 \times 9 \times 4 = 144 \quad 9 \ 4 \\
 \begin{array}{r} 80 \\ 20 \overline{) 4 \times 19 = 76} \\ 16 \overline{) 5 \times 11 = 55} \\ \hline 21 \end{array} & & \begin{array}{r} 144 \\ 36 \overline{) 4 \times 31 = 124} \\ 16 \overline{) 9 \times 9 = 81} \\ \hline 43 \end{array} \\
 \frac{21}{80} \text{ Ans.} & & \frac{43}{144} \text{ Ans.} \\
 (4.) & 4 \overline{) 24 \ 20} & (7.) \\
 \frac{17}{4} - \frac{7}{20} & 6 \ 5 & \frac{13}{17} - \frac{3}{17} \quad 37 \times 11 = 407 \\
 4 \times 6 \times 5 = 120 & & \frac{10}{17} \\
 \begin{array}{r} 120 \\ 24 \overline{) 5 \times 17 = 85} \\ 20 \overline{) 6 \times 7 = 42} \\ \hline 43 \end{array} & & \begin{array}{r} 407 \\ 37 \overline{) 11 \times 18 = 198} \\ 11 \overline{) 37 \times 3 = 111} \\ \hline 87 \end{array} \\
 \frac{43}{120} \text{ Ans.} & & \frac{87}{407} \text{ Ans.}
 \end{array}$$

$$\frac{111}{18} - \frac{1}{18} \quad (8.) \quad 200 \times 19 = 3800$$

$$\begin{array}{r} 3800 \\ 200 \overline{) 19 \times 111 = 2109} \\ 19 \overline{) 200 \times 1 = 200} \\ \hline 1909 \text{ Ans.} \\ 3800 \end{array}$$

$$\frac{1}{10} - \frac{1}{1000} \quad (9.) \quad 10 \overline{) 10 \ 1000} \\ 10 \times 100 = 1000 \quad 1 \ 100$$

$$\begin{array}{r} 1000 \\ 10 \overline{) 100 \times 1 = 100} \\ 1000 \overline{) 1 \times 1 = 1} \\ \hline 99 \text{ Ans.} \\ 1000 \end{array}$$

$$\frac{2}{3} \times \frac{2}{11} = \frac{4}{33} = \frac{1}{11}; \frac{1}{11} \times \frac{2}{3} = \frac{2}{33} = \frac{1}{11} \\ \frac{1}{11} - \frac{1}{11} \quad 11 \times 14 = 154$$

$$\begin{array}{r} 154 \\ 11 \overline{) 14 \times 6 = 84} \\ 14 \overline{) 11 \times 1 = 11} \\ \hline 73 \text{ Ans.} \\ 154 \end{array}$$

(ART. 149, p. 152.)

$$7. \text{ From } 23 \\ \text{Take } 13\frac{1}{2} \\ \text{Ans. } 9\frac{1}{2}$$

$$8. 47 \\ \underline{28} \\ \text{Ans. } 46\frac{7}{8}$$

$$9. 139 \\ \underline{75\frac{1}{2}} \\ \text{Ans. } 63\frac{1}{2}$$

(ART. 150, p. 154.)

NOTE. In the following questions, the new numerator is found by multiplying each numerator by the denominator of the other fraction; and the common denominator is obtained by multiplying together the two denominators.

$$(12.) \quad 19\frac{1}{8} = 19\frac{11}{88} \\ 7\frac{2}{11} = 7\frac{16}{88} \\ \text{Ans. } 11\frac{27}{88}$$

$$(13.) \quad 15\frac{1}{7} = 15\frac{4}{28} \\ 8\frac{1}{4} = 8\frac{7}{28} \\ \text{Ans. } 6\frac{23}{28}$$

$$(14.) \quad 9\frac{1}{3} = 9\frac{16}{48} \\ 3\frac{1}{8} = 3\frac{6}{48} \\ \text{Ans. } 5\frac{22}{48}$$

$$(15.) \quad 71\frac{1}{5} = 71\frac{12}{60} \\ 13\frac{1}{7} = 13\frac{8}{56} \\ \text{Ans. } 57\frac{87}{196}$$

$$(11.) \quad \frac{1}{9} \times \frac{9}{10} = \frac{1}{10}; \frac{1}{12} \times \frac{12}{13} = \frac{1}{13}$$

$$\frac{1}{10} - \frac{1}{13} \quad 10 \times 13 = 130$$

$$\begin{array}{r} 130 \\ 10 \overline{) 13} \\ 13 \overline{) 10} \\ \hline 3 \text{ Ans.} \\ 130 \end{array}$$

$$(12.) \quad \frac{2}{3} \times 12\frac{1}{2} = \frac{2}{3} \times \frac{25}{2} = \frac{25}{3} = 8\frac{1}{3}; \\ \frac{2}{3} \times 9\frac{1}{2} = \frac{2}{3} \times \frac{19}{2} = \frac{19}{3} = 6\frac{1}{3} = \\ 8\frac{1}{3}; 8\frac{1}{3} - 8\frac{1}{3}$$

$$\begin{array}{r} 2 \overline{) 16 \ 6} \\ \underline{8 \ 3} \end{array} \quad 2 \times 8 \times 3 = 48 \\ \begin{array}{r} 48 \\ 16 \overline{) 3 \times 77 = 231} \\ 6 \overline{) 8 \times 23 = 184} \\ \hline 47 \text{ Ans.} \\ 48 \end{array}$$

(16.)	(17.)	(18.)
$61\frac{1}{4} = 61\frac{1}{4}$	63	$2\frac{1}{2} = 2\frac{1}{2}$
$33\frac{1}{4} = 33\frac{1}{4}$	$12\frac{3}{4}$	$3\frac{1}{2} = 3\frac{1}{2}$
Ans. $27\frac{1}{4}$	Ans. $50\frac{3}{4}$	$1\frac{1}{2} = 1\frac{1}{2}$
		$6\frac{7}{8}$

2. Art. 153, p. 155.)	$6\frac{3}{4}$	8.	$352\frac{6}{11}$
3.	$2\frac{3}{4}$	9.	$43\frac{1}{2}$
4.	$1\frac{7}{8}$	10.	$\$7\frac{7}{8}$
5.	49	11.	$\$0.42$
6.	$76\frac{1}{2}$	12.	$\$3.24$
7.	$166\frac{1}{2}$	13.	$\$69\frac{1}{2}$

2. (Art. 154, p. 156.)	28	6.	$243\frac{1}{7}$
3.	88	7.	$8\frac{2}{3}$
4.	325	8.	$23\frac{3}{4}$
5.	1610	9.	$6\frac{1}{8}$

(Art. 155, p. 157.)

(3.)	(4.)	(5.)
$9\frac{3}{4}$	$12\frac{3}{4}$	$8\frac{1}{2}$
5	7	9
45 8) 15	84 5) 21	72 12) 99
$1\frac{7}{8}$	$4\frac{1}{2}$	$8\frac{1}{2}$
Ans. $46\frac{7}{8}$	Ans. $88\frac{1}{2}$	Ans. $80\frac{1}{2}$

(6.)	(7.)	(8.)
$7\frac{1}{8}$	$11\frac{3}{4}$	$7\frac{2}{11}$
10	8	5
70 9) 10	88 7) 48	35 11) 30
$1\frac{1}{2}$	$6\frac{3}{4}$	$2\frac{2}{11}$
Ans. $71\frac{1}{2}$	Ans. $94\frac{3}{4}$	Ans. $\$37\frac{2}{11}$

(9.)	(10.)	(11.)
$23\frac{7}{12}$	$8\frac{3}{4}$	$\$6\frac{3}{8}$
6	5	9
138 12) 42	40 8) 15	54 8) 27
$3\frac{1}{2}$	$1\frac{7}{8}$	$3\frac{3}{8}$
Ans. $\$141\frac{1}{2}$	Ans. $\$41\frac{7}{8}$	Ans. $\$57\frac{3}{8}$

$\begin{array}{r} \text{(12.)} \\ \$6.37\frac{1}{2} \quad 1 \\ \underline{12} \quad \underline{12} \\ 76.44 \quad 2)12 \\ \underline{6} \quad \underline{6} \\ \text{Ans. } \$76.50 \end{array}$	$\begin{array}{r} \text{(13.)} \\ \$9\frac{3}{8} \quad 3 \\ \underline{11} \quad \underline{11} \\ 99 \quad 8)33 \\ \underline{4\frac{1}{2}} \quad \underline{4\frac{1}{2}} \\ \text{Ans. } \$103\frac{1}{2} \end{array}$	$\begin{array}{r} \text{(14.)} \\ \quad 4\frac{3}{8} \quad 3 \\ \$1.75 \quad \$1.75 \\ \underline{7.00} \quad 8)525 \\ \underline{.65\frac{1}{2}} \quad \underline{.65\frac{1}{2}} \\ \text{Ans. } \$7.65\frac{1}{2} \end{array}$
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$\begin{array}{r} \text{(15.)} \\ \$11\frac{7}{8} \quad 7 \\ \underline{7} \quad \underline{7} \\ 77 \quad 8)49 \\ \underline{6\frac{1}{2}} \quad \underline{6\frac{1}{2}} \\ \text{Ans. } \$83\frac{1}{2} \end{array}$	$\begin{array}{r} \text{(16.)} \\ \$10\frac{5}{8} \quad 5 \\ \underline{9} \quad \underline{9} \\ 90 \quad 8)45 \\ \underline{5\frac{1}{2}} \quad \underline{5\frac{1}{2}} \\ \text{Ans. } 95\frac{1}{2} \end{array}$	$\begin{array}{r} \text{(17.)} \\ \$3\frac{1}{2} \quad 1 \\ \underline{5} \quad \underline{5} \\ 15 \quad 5 \\ \underline{0\frac{1}{2}} \quad \underline{\frac{1}{2}} \\ \text{Ans. } \$15\frac{1}{2} \end{array}$
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$\begin{array}{r} \text{(18.)} \\ \$7.62\frac{1}{2} \quad 1 \\ \underline{15} \quad \underline{15} \\ 114.30 \quad 2)15 \\ \underline{7\frac{1}{2}} \quad \underline{7\frac{1}{2}} \\ \text{Ans. } \$114.37\frac{1}{2} \end{array}$	$\begin{array}{r} \text{(19.)} \\ \$8.37\frac{1}{2} \quad 1 \\ \underline{40} \quad \underline{40} \\ 334.80 \quad 2)40 \\ \underline{20} \quad \underline{20} \\ \text{Ans. } \$335.00 \end{array}$
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(ART. 156, P. 158.)

$$2. \frac{7}{8} \times \frac{8}{11} = \frac{7}{11} \text{ Ans.}$$

$$3. \frac{\frac{5}{11}}{\frac{11}{20}} = \frac{1}{2} \text{ Ans.}$$

$$4. \frac{\frac{8}{13}}{\frac{13}{24}} = \frac{1}{3} \text{ Ans.}$$

$$5. \frac{\frac{18}{19}}{\frac{19}{50}} = \frac{1}{5} \text{ Ans.}$$

$$6. \frac{\frac{15}{17}}{\frac{17}{60}} = \frac{1}{4} \text{ Ans.}$$

$$7. \frac{1}{9} \times \frac{8}{17} = \frac{8}{153} \text{ Ans.}$$

$$8. \frac{\frac{6}{23}}{\frac{23}{36}} = \frac{1}{6} \text{ Ans.}$$

$$9. \frac{7}{8} \times \frac{8}{9} = \frac{7}{9} \text{ Ans.}$$

$$10. \frac{\frac{8}{11}}{\frac{11}{32}} = \frac{1}{4} \text{ Ans.}$$

$$11. \frac{7}{10} \times \frac{3}{4} = \frac{21}{40} \text{ Ans.}$$

$$12. \frac{2}{3} \times \frac{3}{8} = \frac{1}{4}; \frac{7}{9} \times \frac{9}{11} = \frac{7}{11}; \frac{1}{4} \times \frac{7}{11} = \frac{7}{44} \text{ Ans.}$$

$$13. \frac{3}{9} \times \frac{4}{7} \times \frac{9}{11} = \frac{12}{77}; \frac{2}{3} \times \frac{18}{1} = \frac{12}{1}; \frac{12}{77} \times \frac{12}{1} = \frac{144}{77} = [1\frac{67}{77} \text{ Ans.}]$$

(ART. 157, p. 159.)

$$2. 7\frac{1}{2} \times 8\frac{3}{4} = \frac{15}{2} \times \frac{33}{4} = \frac{495}{8} = 60\frac{3}{8} \text{ Ans.}$$

$$3. 4\frac{1}{2} \times 9\frac{1}{2} = \frac{9}{2} \times \frac{19}{2} = \frac{171}{2} = 85\frac{1}{2} \text{ Ans.}$$

$$4. 11\frac{7}{8} \times 8\frac{1}{2} = \frac{99}{8} \times \frac{17}{2} = \frac{1683}{4} = 420\frac{3}{4} \text{ Ans.}$$

$$5. 12\frac{3}{4} \times 11\frac{1}{2} = \frac{51}{4} \times \frac{23}{2} = \frac{1173}{2} = 586\frac{1}{2} \text{ Ans.}$$

$$6. 7\frac{1}{2} \times 5\frac{3}{8} = \frac{15}{2} \times \frac{43}{8} = \frac{645}{8} = 80\frac{5}{8} \text{ Ans.}$$

$$7. 7\frac{3}{8} \times 3\frac{1}{2} = \frac{59}{8} \times \frac{7}{2} = \frac{413}{8} = 51\frac{5}{8} \text{ Ans.}$$

$$8. 6\frac{3}{4} \times 23\frac{1}{2} = \frac{13}{2} \times \frac{47}{2} = \frac{611}{2} = 305\frac{1}{2} \text{ Ans.}$$

$$9. 3\frac{1}{2} \times 9\frac{1}{8} = \frac{7}{2} \times \frac{19}{8} = \frac{133}{8} = 16\frac{5}{8} \text{ miles, Ans.}$$

$$10. 361\frac{1}{10} \times 25\frac{3}{8} = \frac{3611}{10} \times \frac{203}{8} = \frac{733993}{80} = 9174\frac{13}{80} \text{ Ans.}$$

$$11. 97\frac{5}{8} \times 49\frac{3}{4} = \frac{1557}{8} \times \frac{99}{2} = \frac{154143}{4} = 38535\frac{3}{4} \text{ rd. Ans.}$$

(ART. 159, p. 161.)

$$3. \frac{6}{13} \div 3 = \frac{2}{13} \text{ Ans.}$$

$$4. \frac{18}{19} \div 6 = \frac{3}{19} \text{ Ans.}$$

$$5. \frac{7}{11} \times 12 = 8\frac{4}{11} \text{ Ans.}$$

$$6. \frac{11}{12} \times 8 = 7\frac{2}{3} \text{ Ans.}$$

$$7. \frac{27}{43} \div 9 = \frac{3}{43} \text{ Ans.}$$

$$8. \frac{75}{98} \div 15 = \frac{5}{98} \text{ Ans.}$$

$$9. \frac{450}{533} \div 75 = \frac{6}{533} \text{ Ans.}$$

$$10. \frac{7}{9} \times 12 = 9\frac{1}{3} \text{ Ans.}$$

$$11. \frac{5}{7} \div 5 = \frac{1}{7} \text{ Ans.}$$

(12.) $\begin{array}{r} \$6.37\frac{1}{2} \quad 1 \\ 12 \quad 12 \\ \hline 76.44 \quad 2)12 \\ 6 \quad 6 \\ \hline \text{Ans. } \$76.50 \end{array}$	(13.) $\begin{array}{r} \$9\frac{3}{8} \quad 3 \\ 11 \quad 11 \\ \hline 99 \quad 8)33 \\ 4\frac{1}{2} \quad 4\frac{1}{2} \\ \hline \text{Ans. } \$103\frac{1}{2} \end{array}$	(14.) $\begin{array}{r} 4\frac{3}{8} \quad 3 \\ \$1.75 \quad \$1.75 \\ \hline 7.00 \quad 8)525 \\ .65\frac{1}{2} \quad .65\frac{1}{2} \\ \hline \text{Ans. } \$7.65\frac{1}{2} \end{array}$
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(15.) $\begin{array}{r} \$11\frac{7}{8} \quad 7 \\ 7 \quad 7 \\ \hline 77 \quad 8)49 \\ 6\frac{1}{8} \quad 6\frac{1}{8} \\ \hline \text{Ans. } \$83\frac{1}{2} \end{array}$	(16.) $\begin{array}{r} \$10\frac{5}{8} \quad 5 \\ 9 \quad 9 \\ \hline 90 \quad 8)45 \\ 5\frac{5}{8} \quad 5\frac{5}{8} \\ \hline \text{Ans. } 95\frac{5}{8} \end{array}$	(17.) $\begin{array}{r} \$3\frac{1}{5} \quad 1 \\ 5 \quad 5 \\ \hline 15 \quad 5 \\ 0\frac{1}{5} \quad \frac{1}{5} \\ \hline \text{Ans. } \$15\frac{1}{5} \end{array}$
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(18.) $\begin{array}{r} \$7.62\frac{1}{2} \quad 1 \\ 15 \quad 15 \\ \hline 114.30 \quad 2)15 \\ 7\frac{1}{2} \quad 7\frac{1}{2} \\ \hline \text{Ans. } \$114.37\frac{1}{2} \end{array}$	(19.) $\begin{array}{r} \$8.37\frac{1}{2} \quad 1 \\ 40 \quad 40 \\ \hline 334.80 \quad 2)40 \\ 20 \quad 20 \\ \hline \text{Ans. } \$335.00 \end{array}$
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(ART. 156, p. 158.)

$$2. \frac{7}{8} \times \frac{8}{11} = \frac{7}{11} \text{ Ans.}$$

$$3. \frac{5}{11} \times \frac{11}{20} = \frac{1}{4} \text{ Ans.}$$

$$4. \frac{8}{13} \times \frac{13}{24} = \frac{1}{3} \text{ Ans.}$$

$$5. \frac{18}{19} \times \frac{19}{90} = \frac{1}{5} \text{ Ans.}$$

$$6. \frac{15}{17} \times \frac{17}{60} = \frac{1}{4} \text{ Ans.}$$

$$7. \frac{1}{9} \times \frac{8}{17} = \frac{8}{153} \text{ Ans.}$$

$$8. \frac{6}{23} \times \frac{23}{36} = \frac{1}{6} \text{ Ans.}$$

$$9. \frac{7}{8} \times \frac{8}{9} = \frac{7}{9} \text{ Ans.}$$

$$10. \frac{8}{11} \times \frac{11}{22} = \frac{1}{2} \text{ Ans.}$$

$$11. \frac{7}{10} \times \frac{3}{4} = \frac{21}{40} \text{ Ans.}$$

$$12. \frac{2}{3} \times \frac{3}{8} = \frac{1}{4}; \frac{7}{9} \times \frac{9}{11} = \frac{7}{11}; \frac{1}{4} \times \frac{7}{11} = \frac{7}{44} \text{ Ans.}$$

$$13. \frac{3}{9} \times \frac{4}{7} \times \frac{9}{11} = \frac{12}{77}; \frac{2}{3} \times \frac{16}{1} = \frac{12}{1}; \frac{12}{77} \times \frac{12}{1} = \frac{144}{77} = [1\frac{7}{77} \text{ Ans.}]$$

(ART. 157, p. 159.)

$$2. 7\frac{1}{2} \times 8\frac{3}{4} = \frac{14}{2} \times \frac{15}{2} = \frac{210}{2} = 105 \frac{1}{2} \text{ Ans.}$$

$$3. 4\frac{1}{2} \times 9\frac{1}{2} = \frac{9}{2} \times \frac{19}{2} = \frac{171}{2} = 85\frac{1}{2} \text{ Ans.}$$

$$4. 11\frac{1}{2} \times 8\frac{3}{4} = \frac{23}{2} \times \frac{15}{2} = \frac{345}{2} = 172\frac{1}{2} \text{ Ans.}$$

$$5. 12\frac{1}{2} \times 11\frac{1}{2} = \frac{25}{2} \times \frac{23}{2} = \frac{575}{2} = 287\frac{1}{2} \text{ Ans.}$$

$$6. 7\frac{1}{2} \times 5\frac{3}{4} = \frac{15}{2} \times \frac{11}{2} = \frac{165}{2} = 82\frac{1}{2} \text{ Ans.}$$

$$7. 7\frac{1}{2} \times 3\frac{1}{2} = \frac{15}{2} \times \frac{7}{2} = \frac{105}{2} = 52\frac{1}{2} \text{ Ans.}$$

$$8. 6\frac{3}{4} \times 23\frac{1}{2} = \frac{13}{2} \times \frac{47}{2} = \frac{611}{2} = 305\frac{1}{2} \text{ Ans.}$$

$$9. 3\frac{1}{2} \times 9\frac{3}{4} = \frac{7}{2} \times \frac{19}{2} = \frac{133}{2} = 66\frac{1}{2} \text{ miles, Ans.}$$

$$10. 361\frac{1}{10} \times 25\frac{3}{5} = \frac{3611}{10} \times \frac{51}{2} = \frac{184961}{2} = 92480\frac{1}{2} \text{ Ans.}$$

$$11. 97\frac{1}{8} \times 49\frac{3}{4} = \frac{1557}{8} \times \frac{99}{2} = \frac{154143}{2} = 77071\frac{1}{2} \text{ rd. Ans.}$$

(ART. 159, p. 161.)

$$3. \frac{6 \div 3}{13} = \frac{2}{13} \text{ Ans.}$$

$$4. \frac{18 \div 6}{19} = \frac{3}{19} \text{ Ans.}$$

$$5. \frac{7}{11} \times 12 = 17\frac{7}{11} \text{ Ans.}$$

$$6. \frac{11}{12} \times 8 = 7\frac{1}{3} \text{ Ans.}$$

$$7. \frac{27 \div 9}{43} = \frac{3}{43} \text{ Ans.}$$

$$8. \frac{75 \div 15}{98} = \frac{5}{98} \text{ Ans.}$$

$$9. \frac{450 \div 75}{533} = \frac{6}{533} \text{ Ans.}$$

$$10. \frac{7}{9} \times 12 = 9\frac{2}{3} \text{ Ans.}$$

$$11. \frac{5 \div 5}{7} = \frac{1}{7} \text{ Ans.}$$

$$12. \frac{\overset{3}{\underset{5}{23}} \times \overset{9}{15}}{5} = 1\frac{3}{5} \text{ Ans.}$$

$$13. \frac{\overset{3}{\underset{14}{17}} \times \overset{6}{28}}{14} = 2\frac{3}{5} \text{ Ans.}$$

2. (ART. 160, p. 161.) $18 \times 8 = 144$; $144 \div 7 = 20\frac{4}{7}$ Ans.
3. $27 \times 12 = 324$; $324 \div 11 = 29\frac{5}{11}$ Ans.
4. $23 \times 4 = 92$; $92 \div 1 = 92$ Ans.
5. $5 \times 5 = 25$; $25 \div 1 = 25$ Ans.
6. $12 \times 4 = 48$; $48 \div 3 = 16$ Ans.
7. $16 \times 2 = 32$; $32 \div 1 = 32$ Ans.
8. $100 \times 19 = 1900$; $1900 \div 17 = 111\frac{3}{17}$ Ans.
9. $50 \times 5 = 250$; $250 \div 3 = 83\frac{1}{3}$ Ans.
10. $60 \times 11 = 660$; $660 \div 9 = 73\frac{1}{3}$ minutes, Ans.

2. (ART. 161, p. 162.) $17\frac{3}{4} \div 7 = 2\frac{3}{8}$ Ans.
3. $18\frac{3}{4} \div 8 = 2\frac{1}{8}$ Ans.
4. $27\frac{1}{2} \div 9 = 3\frac{1}{18}$ Ans.
5. $31\frac{1}{10} \div 11 = 2\frac{8}{110}$ Ans.
6. $78\frac{1}{2} \div 12 = 6\frac{5}{24} = 6\frac{1}{5}$ Ans.
7. $189\frac{1}{2} \div 4 = 47\frac{1}{8}$ Ans.
8. $107\frac{1}{2} \div 3 = 35\frac{5}{6}$ Ans.
9. $\$14\frac{3}{4} \div 7 = \$2\frac{3}{4}$ Ans.
10. $106\frac{1}{2} \div 8 = \$13\frac{1}{16}$ Ans.
11. $100 \times 25 = 2500$; $2500 \div 72 = \$0.34\frac{1}{8}$ Ans.
12. $3 \times 2 = 6$; $6 + 4 = 10$; $107\frac{7}{11} \div 10 = \$10\frac{1}{11}$, boy's share; $\$10\frac{1}{11} \times 2 = \$21\frac{2}{11}$, girl's share, Ans.
13. $\frac{1}{2}$ of a ton is 17cwt.; and, if 17cwt. be divided by 14, the quotient will be 1cwt. 0qr. 24lb. Ans.

W^m

2. (ART. 162, p. 165.) $36 \times 8 = 288$; $9\frac{1}{2} \times 8 = 79$; $288 \div 79 = 3\frac{1}{2}$ Ans.
3. $97 \times 12 = 1164$; $13\frac{1}{2} \times 12 = 167$; $1164 \div 167 = 6\frac{1}{8}$ Ans.
4. $113 \times 7 = 791$; $21\frac{1}{2} \times 7 = 148$; $791 \div 148 = 5\frac{1}{14}$ Ans.
5. $342 \times 131 = 44802$; $14\frac{4}{11} \times 131 = 1881$; $44802 \div 1881 = 23\frac{1}{11}$ Ans.

$$6. 19 \times 7 = 133; 2\frac{3}{4} \times 7 = 17; 133 \div 17 = 7\frac{1}{4} \text{ pieces;}$$

$$1\frac{1}{4} \times 2\frac{3}{4} = \frac{14}{17} \times \frac{17}{7} = \frac{2}{1} = 2\text{ft. Ans.}$$

(ART. 163, p. 164.)

$$2. \frac{1}{2} \times \frac{1}{4} = \frac{1}{8} = 1\frac{1}{8} \text{ Ans.}$$

$$3. \frac{7}{8} \times \frac{4}{1} = \frac{7}{2} = 3\frac{1}{2} \text{ Ans.}$$

$$4. \frac{13}{15} \times \frac{4}{11} = \frac{52}{165} \text{ Ans.}$$

$$5. \frac{2}{3} \times \frac{10}{5} = \frac{20}{3} = 6\frac{2}{3} \text{ Ans.}$$

$$6. \frac{2}{10} \times \frac{1}{1} = \frac{2}{10} = \frac{1}{5} \text{ Ans.}$$

$$7. \frac{4}{5} \times \frac{11}{2} = \frac{22}{5} = 4\frac{2}{5} \text{ Ans.}$$

$$8. \frac{9}{13} \times \frac{26}{3} = \frac{6}{1} = 6 \text{ Ans.}$$

$$9. \frac{19}{20} \times \frac{20}{7} = \frac{19}{7} = 2\frac{5}{7} \text{ Ans.}$$

$$10. \frac{2}{3} \times \frac{7}{8} \times \frac{1}{4} = \frac{7}{12}; \frac{1}{7} \times \frac{2}{9} = \frac{2}{63}; \frac{7}{12} \times \frac{63}{2} = \frac{21}{4} = 5\frac{1}{4} = 18\frac{3}{4} \text{ Ans.}$$

$$11. \frac{4}{9} \times \frac{6}{11} \times \frac{7}{16} = \frac{7}{66}; \frac{2}{3} \times \frac{7}{4} \times \frac{1}{9} = \frac{7}{54}; \frac{7}{66} \times \frac{54}{11} = \frac{7}{11} = 1\frac{6}{11} \text{ Ans.}$$

$$12. \frac{3}{4} \times \frac{5}{7} \times \frac{4}{9} = \frac{5}{21}; \frac{2}{3} \times \frac{6}{7} \times \frac{2}{18} = \frac{4}{63}; \frac{5}{21} \times \frac{63}{4} = \frac{15}{4} = 3\frac{3}{4} \text{ Ans.}$$

$$2. (\text{ART. 164.}) 7\frac{3}{8} = \frac{59}{8}; 4\frac{1}{2} = \frac{9}{2}; \frac{59}{8} \times \frac{9}{2} = \frac{531}{16} = 33\frac{3}{16} \text{ Ans.}$$

$$3. 3\frac{1}{2} = \frac{7}{2}; 7\frac{1}{2} = \frac{15}{2}; \frac{7}{2} \times \frac{2}{15} = \frac{7}{15} \text{ Ans.}$$

$$4. 11\frac{1}{2} = 4\frac{1}{2}; 5\frac{2}{3} = 3\frac{2}{3}; 4\frac{1}{2} \times \frac{7}{3} = 21\frac{1}{2} = 21\frac{1}{2} \text{ Ans.}$$

$$5. 4\frac{2}{3} = 3\frac{1}{3}; 1\frac{1}{2} = 1\frac{1}{2}; 3\frac{1}{3} \times \frac{2}{1\frac{1}{2}} = 21\frac{1}{2} = 21\frac{1}{2} \text{ Ans.}$$

$$6. 116\frac{2}{3} = 21\frac{1}{2}; 14\frac{1}{2} = 2\frac{2}{3}; \frac{815}{7} \times \frac{7}{99} = \frac{815}{99} = 8\frac{2}{9} \text{ Ans.}$$

$$7. 81\frac{1}{2} = 1\frac{1}{2}; 9\frac{1}{2} = 4\frac{1}{2}; \frac{284}{568} \times \frac{5}{46} = \frac{1420}{2608} = 81\frac{1}{2} \text{ Ans.}$$

$$8. \frac{2}{3} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{3}; \frac{5}{8} \times \frac{33}{10} = \frac{165}{80} = \frac{33}{16}; \frac{231}{10} \times \frac{16}{22} = \frac{3696}{220} = \frac{56}{5} = 11\frac{1}{5} \text{ Ans.}$$

(ART. 165, p. 165.)

$$4. \frac{12}{\frac{7}{2}} = \frac{12}{1} \times \frac{2}{7} = 2\frac{2}{7} \text{ [Ans. 28]}$$

$$5. \frac{3}{14} = \frac{3}{7} \times \frac{1}{2} = \frac{3}{14} \text{ Ans.}$$

$$6. \frac{4\frac{1}{2}}{9} = \frac{8\frac{1}{2}}{8} \times \frac{1}{9} = \frac{1}{2} \text{ Ans.}$$

$$7. \frac{8}{9\frac{1}{10}} = \frac{8}{9} \times \frac{10}{11} = \frac{80}{99} \text{ Ans.}$$

$$8. \frac{7}{4\frac{1}{2}} = \frac{7}{\frac{9}{2}} \times \frac{2}{9} = \frac{2}{9} \text{ Ans.}$$

$$9. \frac{6\frac{1}{2}}{\frac{2}{3}} = \frac{27}{4} \times \frac{3}{2} = \frac{81}{8} = 9 \text{ Ans.}$$

$$10. \frac{7\frac{1}{2}}{15\frac{1}{2}} = \frac{31}{4} \times \frac{2}{31} = \frac{1}{2} \text{ Ans.}$$

$$11. \frac{3}{1\frac{1}{2}} = \frac{3}{\frac{3}{2}} \times \frac{2}{11} = \frac{2}{11} \text{ Ans.}$$

$$12. \frac{15}{\frac{2}{3}} = \frac{15}{1} \times \frac{3}{2} = 2\frac{1}{2} \text{ [Ans. 20]}$$

$$13. \frac{3}{15} = \frac{3}{4} \times \frac{1}{15} = \frac{1}{20} \text{ Ans.}$$

$$14. \frac{5\frac{1}{2}}{10} = \frac{2\frac{1}{2}}{2} \times \frac{1}{10} = \frac{1}{8} \text{ Ans.}$$

$$15. \frac{6}{8\frac{1}{2}} = \frac{6}{9} \times \frac{2}{5} = \frac{2}{5} \text{ Ans.}$$

$$16. \frac{5}{7\frac{1}{2}} = \frac{5}{\frac{15}{2}} \times \frac{2}{31} = \frac{2}{31} \text{ Ans.}$$

$$17. \frac{8\frac{1}{2}}{\frac{2}{3}} = \frac{21}{4} \times \frac{3}{2} = 1\frac{1}{2} = 21\frac{1}{2} \text{ [Ans.]}$$

$$18. \frac{9\frac{1}{2}}{12\frac{1}{2}} = \frac{19}{6} \times \frac{2}{12\frac{1}{2}} = \frac{19}{12\frac{1}{2}} \text{ Ans.}$$

$$19. \frac{9\frac{1}{2}}{12\frac{1}{2}} = \frac{37}{4} \times \frac{2}{103} \times \frac{1}{7} = \frac{74}{721} \text{ [Ans.]}$$

$$20. \frac{3}{1\frac{1}{2}} = \frac{3}{\frac{3}{2}} \times \frac{2}{11} = \frac{2}{11} \text{ Ans.}$$

(ART. 166, p. 167.)

$$1. \frac{1}{2} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}; \frac{41}{121} = \frac{2^2 \times 2^2 \times 2^2}{11^2 \times 11^2} = \frac{2^6}{11^4}; \frac{1}{2} + \frac{1}{11^2} = \frac{121}{121} + \frac{11}{121} = \frac{132}{121} \\ + \frac{1}{11^2} = \frac{132}{121} + \frac{11}{121} = \frac{143}{121} \text{ Ans.}$$

$$2. \frac{72}{4} = \frac{2^3 \times 3^2}{2^2} = \frac{2^1 \times 3^2}{1} = \frac{18}{1}; \frac{7}{12} = \frac{7}{1} \times \frac{12}{12} = \frac{84}{12}; \frac{18}{1} + \frac{84}{12} = \frac{216}{12} + \frac{84}{12} = \frac{300}{12} \\ + \frac{1}{12} = \frac{300}{12} + \frac{1}{12} = \frac{301}{12} \text{ Ans.}$$

$$3. \frac{7}{12} = \frac{7}{12} \times \frac{12}{12} = \frac{84}{12}; \frac{7}{8} = \frac{7}{8} \times \frac{5}{5} = \frac{35}{40}; \frac{1}{2} = \frac{1}{2} \times \frac{2}{2} = \frac{1}{1}; \frac{84}{12} + \frac{35}{40} + \frac{1}{1} = \frac{280}{40} + \frac{35}{40} + \frac{40}{40} = \frac{355}{40} = \frac{71}{8} \text{ Ans.}$$

$$4. \frac{2}{15} = \frac{2}{15} \times \frac{1}{1} = \frac{2}{15}; \frac{15}{2} = \frac{15}{2} \times \frac{4}{4} = \frac{30}{2}; \frac{2}{15} + \frac{30}{2} = \frac{4}{30} + \frac{450}{30} = \frac{454}{30} \text{ Ans.}$$

$$5. \frac{23}{32} = \frac{19}{8} \times \frac{4}{15} = \frac{76}{120}; \frac{7}{4} \times \frac{1}{2} = \frac{7}{8}; \frac{76}{120} - \frac{7}{8} = \frac{76}{120} - \frac{105}{120} = \frac{-29}{120} \text{ Ans.}$$

$$6. \frac{187}{8} = 18 + \frac{7}{8} \times \frac{8}{5} = 18\frac{7}{5} = \frac{94}{5}; \frac{63}{7} = \frac{20}{1} \times \frac{1}{2} = \frac{10}{1} \\ \frac{94}{5} - \frac{10}{1} = \frac{94}{5} - \frac{50}{5} = \frac{44}{5} \text{ Ans.}$$

$$7. \frac{3}{8} = \frac{3}{8} \times \frac{1}{1} = \frac{3}{8}; \frac{1}{2} \times \frac{2}{2} = \frac{1}{1}; \frac{3}{8} - \frac{1}{1} = \frac{3}{8} - \frac{8}{8} = \frac{-5}{8} \text{ Ans.}$$

$$8. \frac{62}{27} = \frac{27}{4} \times \frac{4}{3} = \frac{27}{3} = 9; \frac{1}{2} = \frac{1}{2} \times \frac{2}{2} = \frac{1}{1}; 9 - \frac{1}{1} = \frac{8}{1} = 8 \text{ Ans.}$$

$$9. \frac{82}{5} = \frac{2^2 \times 2^2 \times 2^2}{5} = \frac{2^6}{5} = \frac{64}{5}; \frac{52}{10} = \frac{2^2 \times 2^2 \times 2^2}{2 \times 5} = \frac{2^5}{5} = \frac{32}{5}; \frac{64}{5} - \frac{32}{5} = \frac{32}{5} = 6\frac{2}{5} \text{ Ans.}$$

$$10. \frac{7}{12} = \frac{7}{12} \times \frac{1}{1} = \frac{7}{12}; \frac{8}{5} = \frac{8}{5} \times \frac{1}{1} = \frac{8}{5}; \frac{7}{12} + \frac{8}{5} = \frac{35}{60} + \frac{96}{60} = \frac{131}{60} = 2\frac{11}{60} \text{ Ans.}$$

$$11. \frac{7}{11} = \frac{7}{7} \times \frac{11}{11} = \frac{22}{11}; \frac{32}{7\frac{1}{2}} = \frac{15}{1} \times \frac{2}{27} = \frac{122}{27}; \frac{122}{27} \times \frac{22}{11} =$$

[4422 Ans.

$$12. \frac{2}{3} \times \frac{84}{6\frac{1}{2}} = \frac{3}{4} \times \frac{44}{5} \times \frac{5}{32} = \frac{11}{32}; \frac{4}{5} \times \frac{7}{16} = \frac{4}{9} \times \frac{2}{7} \times \frac{1}{16}$$

$$= \frac{11}{128}; \frac{33}{32} \times \frac{1}{128} = \frac{11}{42} \text{ Ans.}$$

$$13. \frac{3\frac{1}{2}}{5\frac{1}{2}} = \frac{7}{2} \times \frac{4}{23} = \frac{14}{23}; \frac{6\frac{1}{2}}{2\frac{1}{2}} = \frac{25}{1} \times \frac{2}{27} = \frac{225}{27}; \frac{225}{27} \times \frac{14}{23} =$$

157\frac{1}{2} = 157\frac{1}{2} \text{ Ans.}

$$14. \frac{4}{5} = \frac{4}{4} \times \frac{7}{7} = \frac{28}{7}; \frac{12}{1\frac{1}{2}} = \frac{12}{1} \times \frac{1}{11} = \frac{12}{11}; \frac{20}{49} \times \frac{77}{60} =$$

\frac{11}{11} \text{ Ans.}

$$15. \frac{3\frac{1}{2}}{7\frac{1}{2}} = \frac{25}{1} \times \frac{6}{17} = \frac{150}{17}; \frac{2}{4} = \frac{2}{2} \times \frac{7}{7} = \frac{21}{7}; \frac{150}{17} \times \frac{8}{21} =$$

\frac{400}{2303} \text{ Ans.}

$$16. \frac{7}{11} \times 12\frac{1}{2} = \frac{7}{1} \times \frac{14}{2} \times \frac{25}{2} = \frac{1225}{2}; \frac{1}{7\frac{1}{2}} \times 8\frac{1}{2} = \frac{1}{1} \times$$

$$\frac{2}{15} \times \frac{35}{4} = \frac{7}{2}; \frac{275}{48} \times \frac{18}{7} = \frac{825}{8} = 103\frac{1}{8} \text{ Ans.}$$

$$17. \frac{4\frac{1}{2}}{3\frac{1}{2}} = \frac{12}{5} \times \frac{5}{16} = \frac{15}{8}; \frac{5\frac{1}{2}}{2\frac{1}{2}} = \frac{21}{4} \times \frac{6}{13} = \frac{63}{13}; \frac{15}{8} \times \frac{63}{13} =$$

$$\frac{1865}{104}; \frac{6\frac{1}{2}}{1\frac{1}{4}} = \frac{12}{1} \times \frac{7}{11} = \frac{84}{11}; \frac{2\frac{1}{2}}{5} = \frac{17}{5} \times \frac{2}{5} = \frac{152}{25};$$

$$\frac{84}{11} \times \frac{152}{25} = \frac{12528}{275}; \frac{1265}{416} \times \frac{55}{13923} = \frac{375}{1326} \text{ Ans.}$$

MISCELLANEOUS EXERCISES IN VULGAR FRACTIONS.

(PAGE 168.)

$$1. 76\frac{7}{8} = 128\frac{7}{8}; 18\frac{1}{2} = 7\frac{1}{2}; \frac{1907}{25} \times \frac{3}{4} = \frac{5721}{4} = 1430\frac{1}{4}p. \\ = 8A. 3R. 30\frac{1}{4}p. \text{ Ans.}$$

$$2. 7\frac{1}{2} = 3\frac{1}{2}; 1\frac{1}{2} = \frac{1}{2}; 1\frac{1}{2} = \frac{1}{2}; \frac{31}{4} \times \frac{7}{4} \times \frac{5}{4} \times \frac{10}{1} = \frac{5425}{2} \\ = 169\frac{1}{2}\text{ cubic feet. Ans.}$$

$$3. \frac{1}{11} \text{ of an acre} = 2R. 21p. 222\frac{1}{2}\text{ft. From this we subtract} \\ 20p. 200\text{ft.}; \text{ and there remain } 2R. 1p. 22\frac{1}{2}\text{ft.} = \\ 22075\text{ft. Ans.}$$

$$4. 1\frac{1}{2} \times 1\frac{1}{2} \times 1\frac{1}{2} = \frac{2019222}{13} = \$236.92\frac{4}{13} \text{ Ans.}$$

$$5. 15\frac{1}{2} = 3\frac{1}{2}; \frac{3}{19} \times \frac{20}{1} \times \frac{63}{4} = \frac{243}{19} = \$49.73\frac{1}{19} \text{ Ans.}$$

$$6. 14\frac{1}{2} = 7\frac{1}{2}; 11\frac{1}{2} = 3\frac{1}{2}; 5\frac{1}{2} = 4\frac{1}{2}; 10\frac{1}{2} = 4\frac{1}{2}; \frac{72}{5} \times \frac{4}{7} \times \\ \frac{7}{49} \times \frac{41}{4} = 9184 \text{ Ans.}$$

$$7. 7 - \frac{1}{4} = 6\frac{3}{4}; \frac{7}{12} \times \frac{3}{7} = \frac{1}{4}; \frac{112}{1} \times \frac{1}{4} = 28; 12\frac{1}{2} = 4\frac{1}{2}; \\ \frac{51}{4} \times \frac{28}{1} = 287 = \$3.57 \text{ Ans.}$$

$$8. 19\frac{1}{2} = 12\frac{1}{2}; 7\frac{1}{2} = 3\frac{1}{2}; \frac{136}{7} \times \frac{59}{8} = \frac{1002}{1} = \$143\frac{1}{2} \text{ Ans.}$$

$$9. 13\frac{3}{4} = 11\frac{3}{4}; 3\frac{1}{2} = 1\frac{1}{2}; 1\frac{1}{2} \times \frac{1}{4} = \frac{2103}{1} = \\ \$512\frac{1}{4} \text{ Ans.}$$

$$10. 7\frac{7}{10} = 7\frac{14}{20}; 9\frac{1}{2} = 9\frac{10}{20}; 7\frac{14}{20} + 9\frac{10}{20} = 17\frac{24}{20} = 18\frac{6}{5};$$

$$78\frac{3}{8} = 82\frac{1}{2}; \frac{1057}{60} \times \frac{627}{8} = \frac{220913}{160} = \$1380.70\frac{1}{2} \text{ Ans.}$$

$$11. 175\frac{3}{8} = 175\frac{3}{8}; \frac{3}{8} - \frac{2}{8} = \frac{1}{8}; 175\frac{3}{8} \times \frac{1}{8} = 175\frac{3}{64}; \frac{3}{8} - \frac{1}{8} = \frac{1}{4};$$

$$175\frac{3}{64} \times \frac{1}{4} = 175\frac{3}{256}; 8\frac{3}{4} = 8\frac{18}{24}; \frac{1756}{75} \times \frac{35}{4} = 207\frac{1}{2} =$$

$$\$2.041\frac{1}{2} \text{ Ans.}$$

$$12. 475 \div 3 = 158\frac{1}{3}; 158\frac{1}{3} \times .08 = \$12.66\frac{2}{3}; 475 - 158\frac{1}{3}$$

$$= 316\frac{2}{3}; \frac{2}{3} \times 316\frac{2}{3} = 211\frac{1}{3}; 211\frac{1}{3} \times .10 = \$21.11\frac{1}{3};$$

$$316\frac{2}{3} - 211\frac{1}{3} = 105\frac{1}{3}; 105\frac{1}{3} \times .12\frac{1}{2} = \$13.19\frac{1}{6} \text{ Ans.}$$

$$\$21.11\frac{1}{3} + \$12.66\frac{2}{3} + \$13.19\frac{1}{6} = \$46.97\frac{5}{6}; \$46.97\frac{5}{6}$$

$$- \$30.00 = \$16.97\frac{5}{6}, \text{ Green's bargain, Ans.}$$

$$13. 14\frac{2}{7} = 19\frac{1}{7}; \frac{14}{101} \times \frac{101}{7} = \$2.00 \text{ Ans.}$$

$$14. \frac{7}{8} \times \frac{8}{11} \times \frac{11}{14} = \frac{1}{2}; \frac{5}{17} \times \frac{17}{19} \times \frac{19}{25} = \frac{1}{5}; \frac{1}{2} \times \frac{1}{5} = \frac{1}{10} \text{ [Ans.]}$$

$$15. 11\frac{3}{4} = 4\frac{7}{4}; 4\frac{7}{4} = 1\frac{1}{4}; 1\frac{1}{4} \times 1\frac{1}{4} = 1\frac{9}{16} = 49\frac{1}{16} \text{ sq. in. Ans.}$$

$$16. 18\frac{3}{4} = 12\frac{3}{4}; 9\frac{1}{10} = \frac{9}{10}; 12\frac{3}{4} \times \frac{9}{10} = 12\frac{27}{40} = 178\frac{3}{8}$$

rods, Ans.

$$17. 19\frac{3}{4} = 7\frac{9}{4}; 17\frac{3}{4} = 7\frac{1}{4}; 7\frac{9}{4} \times 7\frac{1}{4} = 56\frac{1}{2} = \$350\frac{1}{2} \text{ Ans.}$$

$$18. 14\frac{7}{10} = 28\frac{7}{10}; 7\frac{3}{4} = 3\frac{1}{4}; 28\frac{7}{10} \times 3\frac{1}{4} = 288\frac{7}{20} = \$111\frac{1}{10} \text{ Ans.}$$

$$19. 13\frac{1}{10} = 27\frac{1}{10}; 8\frac{7}{8} = 7\frac{1}{8}; 27\frac{1}{10} \times 7\frac{1}{8} = 192\frac{1}{40} = \$120\frac{1}{10} \text{ Ans.}$$

$$20. 1\frac{1}{8} = \frac{1}{8}; 1\frac{1}{8} = \frac{1}{8}; \frac{1}{8} \times \frac{1}{8} = \frac{1}{64} = \$3\frac{3}{4} \text{ Ans.}$$

$$21. \frac{9}{16} \times \frac{100}{1} = 22\frac{1}{4} = \$0.56\frac{1}{4} \text{ Ans.}$$

$$22. \frac{17}{80} \times \frac{100}{1} = 2\frac{1}{4} = \$0.21\frac{1}{4} \text{ Ans.}$$

$$23. \frac{41}{100} \times \frac{100}{1} = 20\frac{1}{2} = \$0.25\frac{1}{2} \text{ Ans.}$$

$$24. \frac{33}{64} \times \frac{100}{1} = 22\frac{1}{2} = \$0.51\frac{1}{2} \text{ Ans.}$$

$$25. \text{As } \frac{1}{2} \text{ leaked out, } \frac{1}{2} \text{ remained in the cask, therefore } 87\frac{1}{2} = 17\frac{1}{2}; \frac{1}{2} \times 17\frac{1}{2} = 8\frac{1}{4}; 27\frac{1}{2} = 5\frac{1}{2}; 5\frac{1}{2} \times 5\frac{1}{2} = 29\frac{1}{4} = \$15.03\frac{1}{4} \text{ Ans.}$$

$$26. 7\frac{3}{8} = 5\frac{3}{8}; 3\frac{1}{8} = 2\frac{1}{8}; 5\frac{3}{8} \times 2\frac{1}{8} = 10\frac{3}{8}; 4\frac{3}{8} = 3\frac{5}{8}; 5\frac{3}{8} \times 3\frac{5}{8} = 20\frac{3}{8}; 20\frac{3}{8} - 10\frac{3}{8} = 10\frac{3}{8} = \$3.68\frac{3}{8} \text{ Ans.}$$

$$27. 47\frac{1}{11} = 42\frac{2}{11}; 29\frac{1}{16} = 27\frac{1}{16}; \frac{261}{11} \times \frac{471}{16} = 1222\frac{21}{16} =$$

$$1396\frac{3}{8} \text{ square rods; } 5 \times 5 = 25; 25 \div 5 = 5; 1396\frac{3}{8} - 5 = 1391\frac{3}{8} \text{ square rods, Ans.}$$

$$28. 48\frac{1}{2} = 7\frac{1}{2}; 7\frac{1}{2} \times 27 = 202\frac{1}{2} = 4722\frac{1}{2} \text{ square rods, } 18\frac{1}{2} = 2\frac{1}{2}; 14\frac{1}{2} = 1\frac{1}{2}; 2\frac{1}{2} \times 1\frac{1}{2} = 3\frac{1}{4} = 264\frac{1}{4} \text{ square rods; } 4722\frac{1}{2} - 264\frac{1}{4} = 4457\frac{1}{4}; 4457\frac{1}{4} \times \$3.75 = \$16717.30\frac{1}{4} \text{ Ans.}$$

$$29. 7\frac{1}{2} = 2\frac{1}{2}; 4\frac{1}{2} = 1\frac{1}{2}; 3\frac{1}{2} = 2\frac{1}{2}; 2\frac{1}{2} \times 1\frac{1}{2} \times 2\frac{1}{2} = 8\frac{1}{8};$$

$$\frac{37789}{144} \times \frac{100}{1} = 2624\frac{1}{4} = 1312\frac{1}{4} \text{ feet, Ans.}$$

$$30. \$17.87\frac{1}{2} \div 2 = \$8.93\frac{1}{2}. \text{ Now, if } \frac{2}{3} \text{ of this sum were given to the Bible Society, } \frac{1}{3} \text{ of it will remain; therefore, } \$8.93\frac{1}{2} \times \frac{1}{3} = \$2.97\frac{1}{2} \text{ Ans.}$$

$$31. 10\frac{1}{2} = 5\frac{1}{2}; 50 \times 5 = 250; 250 \div 54 = 4\frac{1}{2}; 12\frac{1}{2} - 4\frac{1}{2} = 8\frac{1}{2} \text{ Ans.}$$

$$32. 7\frac{1}{2} = 5\frac{1}{2}; 20 \times 8 = 160; 160 \div 59 = 2\frac{1}{2} \text{ Ans.}$$

$$33. 9\frac{1}{2} = 7\frac{1}{2}; \$4.62\frac{1}{2} = 2\frac{1}{2}; 7\frac{1}{2} \times 2\frac{1}{2} = 18\frac{1}{4} = \$45.67\frac{1}{4} \text{ Ans.}$$

$$34. 47\frac{1}{2} = 12\frac{1}{2}; \$12.37\frac{1}{2} = 24\frac{1}{2}; 12\frac{1}{2} = 12\frac{1}{2}; \frac{2475}{2} \times \frac{4}{191}$$

$$\times \frac{103}{8} = 24\frac{1}{2} \times \frac{103}{8} = \$3.33\frac{1}{2} \text{ Ans.}$$

$$35. \$15.87\frac{1}{2} = 21\frac{1}{2}; 12\frac{1}{2} = 2\frac{1}{2}; \frac{3175}{2} \times \frac{8}{99} \times \frac{11}{1} = 12\frac{1}{2}$$

$$= \$14.11\frac{1}{2} \text{ Ans.}$$

$$36. \$19.18\frac{3}{4} = 18\frac{3}{4}; 3\frac{1}{2} = 2\frac{1}{2}; \frac{7675}{4} \times \frac{8}{27} \times \frac{3}{8} = 18\frac{3}{4}$$

$$= \$2.13\frac{7}{8} \text{ Ans.}$$

$$37. 8\frac{1}{2} = 12\frac{1}{2}; 3\frac{1}{2} = 4\frac{1}{2}; 2\frac{1}{2} = 2\frac{1}{2}; 12\frac{1}{2} \times 4\frac{1}{2} \times 2\frac{1}{2} =$$

$$117\frac{1}{2} = 68\frac{1}{2} \text{ feet, Ans.}$$

38. If $\frac{2}{3}$ of this field be planted with corn, $\frac{1}{3}$ of the field will remain unplanted. And, if $\frac{2}{3}$ of this remainder be sown with wheat, then there will remain $\frac{1}{3}$ of the whole field; because, if $\frac{2}{3}$ of $\frac{1}{3} = \frac{2}{9}$ be taken from $\frac{1}{3}$, the remainder will be $\frac{1}{9}$; thus, $\frac{1}{3} = \frac{2}{9} + \frac{1}{9} = \frac{3}{9}$. If, then, $\frac{2}{3}$ of this $\frac{1}{3}$ be planted with potatoes, $\frac{1}{9}$ of the $\frac{1}{3}$ will remain; and $\frac{1}{9}$ of $\frac{1}{3}$ is $\frac{1}{27}$. That is, the 3 rods square and the 3 square rods are $\frac{4}{27}$ of the whole field; but 3 rods square are 9 square rods; and if, to these, we add the 3 square rods, the whole amount will be 12 square rods. If, then, 12 square rods be $\frac{4}{27}$ of the field, 3 square rods will be $\frac{1}{3}$ of the field; and, if $\frac{1}{3}$ of the field be 3 rods, $\frac{2}{3}$, or the whole field, will be 63 times as much, that is, $63 \times 3 = 189$ square rods = 1A. 0R. 29p. Ans.

$$2. (\text{ART. 167, p. 171.}) \frac{1}{1400} \times \frac{20}{1} \times \frac{12}{1} \times \frac{4}{1} = 3\frac{1}{2} \text{ Ans.}$$

$$\frac{70}{35}$$

$$3. \frac{4}{75} \times \frac{12}{1} = 1\frac{1}{2} \text{ Ans.}$$

$$25$$

$$4. \frac{1}{\cancel{8640}^{720} \cancel{36}^3} \times \frac{12}{1} \times \frac{20}{1} \times \frac{24}{1} = \frac{2}{3} \text{ Ans.}$$

$$5. \frac{1}{\cancel{1728}^{432} \cancel{27}^3} \times \frac{4}{1} \times \frac{28}{1} \times \frac{16}{1} = \frac{22}{7} = 1\frac{1}{7} \text{ Ans}$$

$$6. \frac{1}{\cancel{1320}^{33} \cancel{2}^1} \times \frac{40}{1} \times \frac{16\frac{1}{2}}{1} = \frac{1}{2} \text{ Ans.}$$

$$7. \frac{1}{\cancel{58080}^{363}} \times \frac{160}{1} \times \frac{272\frac{1}{2}}{1} = \frac{272\frac{1}{2}}{363} = \frac{1022}{121} = \frac{2}{1} \text{ Ans.}$$

$$8. \frac{1}{\cancel{89600}^{11200} \cancel{28}^3} \times \frac{24}{1} \times \frac{60}{1} \times \frac{60}{1} = \frac{27}{5} \text{ Ans.}$$

$$9. \frac{3}{\cancel{14}^7} \times \frac{4}{1} = \frac{2}{7} \text{ Ans.}$$

$$10. \frac{1}{\cancel{200}^{50} \cancel{25}^2} \times \frac{4}{1} \times \frac{28}{1} = \frac{11}{5} \text{ Ans.}$$

$$2. (\text{ART. 168.}) \frac{4}{7} \times \frac{1}{\cancel{24}^6} \times \frac{1}{20} \times \frac{1}{12} = \frac{1}{1050} \text{ Ans.}$$

$$3. \frac{3}{10} \times \frac{1}{3} \times \frac{1}{8} = \frac{1}{80} \text{ Ans.}$$

$$4. \frac{4}{5} \times \frac{1}{\cancel{16}^4} \times \frac{1}{28} \times \frac{1}{4} \times \frac{1}{20} = \frac{1}{1400} \text{ Ans.}$$

$$5. \frac{8}{9} \times \frac{1}{40} \times \frac{1}{8} = \frac{1}{360} \text{ Ans.}$$

$$6. \frac{2}{3} \times \frac{1}{272\frac{1}{4}} \times \frac{1}{40} \times \frac{1}{\frac{1}{4}} = \frac{1}{55140} \text{ Ans.}$$

$$7. \frac{24}{25} \times \frac{1}{60} \times \frac{1}{60} \times \frac{1}{24} = \frac{1}{50000} \text{ Ans.}$$

$$8. \frac{4}{9} \times \frac{1}{272\frac{1}{4}} \times \frac{1}{40} \times \frac{1}{4} \times \frac{1}{3} = \frac{1}{281000} \text{ Ans.}$$

$$9. \frac{4}{7} \times \frac{1}{4} \times \frac{1}{63} \times \frac{1}{3} = \frac{1}{1323} \text{ Ans.}$$

10. A solid foot contains 1728 cubic inches, and $\frac{1}{4}$ of 1728 is 288. One sixth of a yard is 6 inches, and a cube whose sides measure 6 inches each contains $6 \times 6 \times 6 = 216$ cubic inches, and 216 is $\frac{3}{4}$ of 288; thus $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$ Ans.

(ART. 169, p. 173.)

(2.)	(3.)	(4.)	
7	7	3	
4	4	4	(Brought up.)
9)28(3qr.	9)28(3qr.	7)12(1R.	7)1089(155ft.
27	27	7	7
1	1	5	38
28	4	40	35
9)28(3lb.	9)4(0 $\frac{1}{3}$ na.	7)200(28p.	39
27		14	35
1		60	4
16		56	144
9)16(1oz.		4	7)576(82 $\frac{1}{2}$ in.
9		272 $\frac{1}{4}$	56
7		1089	16
16		(Carried up.)	14
9)112(12 $\frac{1}{2}$ dr.			2
108			
4			

(5.)	(6.)	(7.)	(8.)
$\begin{array}{r} 2 \\ 8 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ 5 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ 63 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ 365\frac{1}{4} \\ \hline \end{array}$
9)16(1fur. $\begin{array}{r} 9 \\ 7 \\ \hline 40 \end{array}$	11)15(1qr. $\begin{array}{r} 11 \\ 4 \\ \hline 4 \end{array}$	7)126(18gal. $\begin{array}{r} 7 \\ 56 \\ \hline 56 \end{array}$	11)2556\frac{3}{4}(232d. $\begin{array}{r} 22 \\ 35 \\ \hline 33 \end{array}$
9)280(31rd. $\begin{array}{r} 27 \\ 10 \\ 9 \\ 1 \\ \hline 16\frac{1}{2} \end{array}$	11)16(1\frac{1}{11}na. $\begin{array}{r} 11 \\ 5 \end{array}$		$\begin{array}{r} 26\frac{3}{4} \\ 22 \\ \hline 4\frac{3}{4} \\ 24 \\ \hline 96 \\ 18 \end{array}$
9)16\frac{1}{2}(1ft. $\begin{array}{r} 9 \\ 7\frac{1}{2} \\ \hline 12 \end{array}$			11)114(10h. $\begin{array}{r} 110 \\ 4 \\ \hline 60 \end{array}$
9)90(10in $\begin{array}{r} 90 \\ \hline \end{array}$			11)240(21m. $\begin{array}{r} 22 \\ 20 \\ 11 \\ 9 \\ \hline 60 \end{array}$
			11)540(49\frac{1}{11}s. $\begin{array}{r} 44 \\ 100 \\ 99 \\ \hline 1 \end{array}$

(ART. 170, p. 173.)

(2.)	(3.)
4s. 8d. = 56	4cwt. 3qr. 12lb. = 544
1£. = 240 = $\frac{7}{8}$ Ans.	1T. = 2240 = $\frac{17}{8}$ Ans.

(4.)	(5.)
2fur. 30rd. = 110	3R. 24p. = 144
2m. 3fur. 20rd. = 780 = $\frac{11}{8}$ Ans.	2A. 2R. 32p. = 432 = $\frac{1}{2}$ Ans.

$$\begin{array}{l} \text{(6.)} \\ 18\text{gal. } 2\text{qt.} = 74 \\ 1\text{hd.} = 252 \end{array} = \frac{37}{128} \text{ Ans.} \quad \begin{array}{l} \text{(7.)} \\ 8\text{d. } 17\text{h. } 20\text{m.} = 12560 \\ 30\text{d.} = 43200 \end{array} = \frac{157}{840} \text{ Ans.}$$

$$\begin{array}{l} \text{(8.)} \\ 5\text{yd. } 2\text{qr. } 2\text{na.} = 90 \\ 13\text{yd. } 0\text{qr. } 2\text{na.} = 210 \end{array} = \frac{3}{7} \text{ Ans.} \quad \begin{array}{l} \text{(9.)} \\ 3\text{yd.} = 3 \\ 3\text{yd.} \times 3\text{yd.} = 9 \end{array} = \frac{1}{3} \text{ Ans.}$$

$$\begin{array}{l} \text{(2.)} \quad (\text{ART. 171, p. 174.}) \quad \text{(3.)} \\ \begin{array}{r} \text{£.} \\ \text{s.} \end{array} \begin{array}{r} \text{d.} \\ \text{na.} \end{array} \begin{array}{r} \text{fur.} \\ \text{in.} \end{array} \\ \frac{1}{11} \text{£.} = 7 \quad 3 \quad 1 \frac{1}{11} \\ \frac{1}{4} \text{s.} = \quad 8 \quad 2 \frac{1}{4} \\ \text{Ans. } 7 \quad 11 \quad 3 \frac{3}{4} \end{array} \quad \begin{array}{r} \text{T.} \\ \text{cwt.} \\ \text{qr.} \\ \text{lb.} \end{array} \\ \frac{1}{11} \text{T.} = \quad 18 \quad 0 \quad 20 \frac{1}{11} \\ \frac{1}{7} \text{T.} = \quad 15 \quad 2 \quad 6 \frac{1}{7} \\ \frac{1}{4} \text{cwt.} = \quad \quad 2 \quad 8 \\ \text{Ans. } 1 \quad 14 \quad 1 \quad 6 \frac{1}{8} \end{array}$$

$$\begin{array}{l} \text{(4.)} \\ \begin{array}{r} \text{yd.} \\ \text{qr.} \\ \text{na.} \\ \text{in.} \end{array} \\ \frac{2}{3} \text{yd.} = \quad 2 \quad 2 \quad 1 \frac{1}{3} \\ \frac{3}{8} \text{yd.} = \quad 3 \quad 2 \quad 0 \frac{1}{2} \\ \frac{1}{4} \text{qr.} = \quad \quad 1 \quad 1 \frac{1}{4} \\ \text{Ans. } 1 \quad 2 \quad 2 \quad 0 \frac{1}{2} \end{array} \quad \begin{array}{l} \text{(5.)} \\ \begin{array}{r} \text{fur.} \\ \text{rd.} \\ \text{yd.} \\ \text{ft.} \\ \text{in.} \end{array} \\ \frac{1}{11} \text{m.} = 2 \quad 36 \quad 2 \quad 0 \quad 0 \\ \frac{1}{8} \text{m.} = 3 \quad 22 \quad 1 \quad 0 \quad 8 \\ \frac{1}{11} \text{fur.} = \quad 10 \quad 5 \quad 0 \quad 0 \\ \frac{1}{7} \text{yd.} = \quad \quad \quad 1 \quad 10 \frac{1}{7} \\ \quad \quad \quad 6 \quad 29 \quad 2 \frac{1}{2} \quad 2 \quad 6 \frac{1}{2} \\ \quad \quad \quad \frac{1}{2} = 1 \quad 6 \\ \text{Ans. } 6 \quad 29 \quad 3 \quad 1 \quad 0 \frac{1}{2} \end{array}$$

$$\begin{array}{l} \text{(6.)} \\ \begin{array}{r} \text{A.} \\ \text{R.} \\ \text{p.} \\ \text{ft.} \\ \text{in.} \end{array} \\ \frac{2}{11} \text{A.} = \quad 3 \quad 10 \quad 247 \quad 72 \\ \frac{1}{8} \text{R.} = \quad \quad 0 \quad 194 \quad 66 \frac{1}{8} \\ \frac{1}{7} \text{p.} = \quad \quad 32 \quad 0 \quad 0 \\ \quad \quad 1 \quad 0 \quad 3 \quad 168 \frac{1}{4} \quad 138 \frac{1}{4} \\ \quad \quad \quad \frac{3}{4} = 108 \\ \text{Ans. } 1 \quad 0 \quad 3 \quad 169 \quad 102 \frac{1}{4} \end{array} \quad \begin{array}{l} \text{(7.)} \\ \begin{array}{r} \text{A.} \\ \text{p.} \\ \text{ft.} \end{array} \\ \frac{1}{11} \text{A.} = 0 \quad 37 \quad 176 \frac{1}{11} \\ \frac{1}{4} \text{A.} = 0 \quad 22 \quad 233 \frac{1}{4} \\ \frac{1}{11} \text{A.} = 0 \quad 29 \quad 24 \frac{1}{11} \\ \frac{1}{8} \text{A.} = 1 \quad 28 \quad 155 \frac{1}{8} \\ \text{Ans. } 3 \quad 38 \quad 45 \frac{1}{8} \end{array}$$

$$\begin{array}{l} \text{(2.)} \quad (\text{ART. 172, p. 175.}) \quad \text{(3.)} \\ \begin{array}{r} \text{cwt.} \\ \text{qr.} \\ \text{lb.} \end{array} \\ \frac{1}{4} \text{T.} = 11 \quad 1 \quad 20 \\ \frac{1}{17} \text{cwt.} = \quad 1 \quad 11 \frac{1}{17} \\ \text{Ans. } 11 \quad 0 \quad 8 \frac{1}{17} \end{array} \quad \begin{array}{r} \text{fur.} \\ \text{rd.} \\ \text{ft.} \\ \text{in.} \end{array} \\ \frac{1}{7} \text{m.} = 6 \quad 8 \quad 14 \quad 8 \\ \frac{1}{15} \text{fur.} = \quad 15 \quad 9 \quad 2 \\ \text{Ans. } 5 \quad 33 \quad 5 \quad 6 \end{array}$$

(5.)

$$\frac{2}{11} \times 100 \text{ gal.} = \frac{27}{11} - \frac{2}{11} = \frac{25}{11} \times \frac{2}{2} = \frac{50}{11} \times 100 \text{ gal.} = 48 \frac{1}{11} \times 100 \text{ gal.}$$

gal.	qt.	pt.
27	1	0 $\frac{2}{11}$
48	1	1 $\frac{2}{11}$
75	3	0 $\frac{2}{11}$

(4.)

$$\frac{1}{4} \text{ A.} = \frac{3}{25} \frac{\text{R.}}{\text{p.}} \frac{123 \frac{1}{2}}{242} \frac{\text{ft.}}{\text{in.}}$$

$$\text{Ans. } 3 \quad 16 \quad 154$$

$$\frac{100}{75} \frac{0}{3} \frac{0}{0 \frac{2}{11}}$$

$$\text{Ans. } 24 \quad 0 \quad 1 \frac{2}{11}$$

(6.)

$$41 \text{ m.} \times \frac{3}{11} = \frac{11}{11} - \frac{1}{11} = \frac{10}{11} \times \frac{3}{2} = \frac{30}{11} \times 41 \text{ m.} = 11 \frac{1}{11} \times 18 \frac{3}{4}$$

m.	fur.	rd.	ft.	in.
11	1	18	3	0
17	0	12	7	8 $\frac{1}{4}$
28	1	30	10	8 $\frac{1}{4}$
41	0	0	0	0
28	1	30	10	8 $\frac{1}{4}$

$$\text{Ans. } 12 \quad 6 \quad 9 \quad 5 \quad 9 \frac{1}{4}$$

(7.)

$$365 \text{ da.} \times \frac{1}{7} = \frac{52}{7} \frac{\text{da.}}{\text{h.}} \frac{3}{25} \frac{\text{m.}}{\text{s.}} \frac{42 \frac{1}{2}}{31 \frac{1}{2}}$$

$$\text{Ans. } 137 \quad 11 \quad 13 \quad 14 \frac{1}{2}$$

QUESTIONS PERFORMED BY ANALYSIS.

2. (p. 176.) $\$7.80 \div 10 = \$0.78$; $\$0.78 \times 3 = \$2.34$ Ans.
3. $\$17.84 \div 8 = \$2.23$; $\$2.23 \times 7 = \$15.61$ Ans.
4. $\$786.63 \div 13 = \$60.51$; $\$60.51 \times 11 = \$665.61$ Ans.
5. $\$87.50 \div 12 = \$7.29 \frac{1}{2}$; $\$7.29 \frac{1}{2} \times 11 = \$80.20 \frac{1}{2}$ Ans.
6. $17 \text{ £. } 18 \text{ s. } 9 \text{ d.} \div 4 = 4 \text{ £. } 9 \text{ s. } 8 \frac{1}{4} \text{ d.}$; $4 \text{ £. } 9 \text{ s. } 8 \frac{1}{4} \text{ d.} \times 3 = 13 \text{ £. } 9 \text{ s. } 0 \frac{1}{4} \text{ d.}$ Ans.
7. $3 \text{ T. } 16 \text{ cwt. } 3 \text{ qr. } 23 \text{ lb.} \div 7 = 10 \text{ cwt. } 3 \text{ qr. } 27 \frac{1}{2} \text{ lb.}$; $10 \text{ cwt. } 3 \text{ qr. } 27 \frac{1}{2} \text{ lb.} \times 4 = 2 \text{ T. } 3 \text{ cwt. } 3 \text{ qr. } 25 \frac{1}{2} \text{ lb.}$ Ans.
8. $27 \text{ A. } 3 \text{ R. } 33 \text{ p.} \div 9 = 3 \text{ A. } 0 \text{ R. } 17 \text{ p.}$; $3 \text{ A. } 0 \text{ R. } 17 \text{ p.} \times 4 = 12 \text{ A. } 1 \text{ R. } 28 \text{ p.}$ Ans.
10. $\$2.34 \div 3 = \$0.78$; $\$0.78 \times 10 = \$7.80$ Ans.
11. $\$15.57 \frac{1}{2} \div 7 = \$2.22 \frac{1}{2}$; $\$2.22 \frac{1}{2} \times 8 = \$17.80$ Ans.
12. $\$665.50 \div 11 = \$60.50$; $\$60.50 \times 13 = \$786.50$ Ans.

13. $\$73.60\frac{1}{2} \div 11 = \$6.69\frac{1}{2}$; $\$6.69\frac{1}{2} \times 12 = \$80.30$ Ans.
14. $13\text{£. } 9\text{s. } 0\frac{1}{2}\text{d.} \div 3 = 4\text{£. } 9\text{s. } 8\frac{1}{2}\text{d.}$; $4\text{£. } 9\text{s. } 8\frac{1}{2}\text{d.} \times 4 = 17\text{£. } 18\text{s. } 9\text{d.}$ Ans.
15. $18\text{cwt. } 0\text{qr. } 12\text{lb.} \div 4 = 4\text{cwt. } 2\text{qr. } 3\text{lb.}$; $4\text{cwt. } 2\text{qr. } 3\text{lb.} \times 17 = 76\text{cwt. } 3\text{qr. } 23\text{lb.}$ Ans.
16. $12\text{A. } 1\text{R. } 30\frac{1}{2}\text{p.} \div 4 = 3\text{A. } 0\text{R. } 17\frac{3}{8}\text{p.}$; $3\text{A. } 0\text{R. } 17\frac{3}{8}\text{p.} \times 9 = 27\text{A. } 3\text{R. } 39\frac{1}{4}\text{p.}$ Ans.
17. $\$80.20\frac{1}{2} \div 11 = \$7.29\frac{1}{2}$; $\$7.29\frac{1}{2} \times 12 = \$87.50$ Ans.
19. $\$2.52 \div 7 = \$0.36$; $\$0.36 \times 11 = \$3.96$; $\$3.96 \div 9 = \$0.44$; $\$0.44 \times 4 = \$1.76$ Ans.
20. $\$80.00 \div 3 = \$26.66\frac{2}{3}$; $\$26.66\frac{2}{3} \times 4 = \$106.66\frac{2}{3}$; $\$106.66\frac{2}{3} \div 8 = \$13.33\frac{1}{3}$; $\$13.33\frac{1}{3} \times 7 = \$93.33\frac{1}{3}$ Ans.
21. $\$631.89 \div 9 = \$70.21$; $\$70.21 \times 16 = \$1123.36$; $\$1123.36 \div 14 = \$80.24$; $\$80.24 \times 5 = \$401.20$ Ans.
22. $\$141.52 \div 4 = \$35.38$; $\$35.38 \times 5 = \$176.90$; $\$176.90 \div 29 = \$6.10$; $\$6.10 \times 5 = \$30.50$ Ans.
23. $\$1728 \div 3 = \$576$; $\$576 \times 8 = \$4608$; $\frac{5}{8} - \frac{3}{8} = \frac{1}{4}$; $\frac{5}{8} \times \frac{4}{5} = \frac{1}{2}$; $\$4608 \times \frac{1}{2} = \$2304$ Ans.
24. $\$82.80 \div 4 = \$20.70$; $\$20.70 \times 7 = \$144.90$; $\frac{7}{7} - \frac{4}{7} = \frac{3}{7}$; $\frac{3}{7} \times \frac{2}{3} = \frac{2}{7}$; $\$144.90 \div 7 = \$20.70$; $\$20.70 \times 2 = \$41.40$ Ans.
25. $26\text{£. } 12\text{s. } 6\text{d.} \div 5 = 5\text{£. } 6\text{s. } 6\text{d.}$; $5\text{£. } 6\text{s. } 6\text{d.} \times 9 = 47\text{£. } 18\text{s. } 6\text{d.}$; $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$; $\frac{4}{9} \times \frac{7}{8} = \frac{7}{18}$; $47\text{£. } 18\text{s. } 6\text{d.} \div 2 = 18 = 2\text{£. } 13\text{s. } 3\text{d.}$; $2\text{£. } 13\text{s. } 3\text{d.} \times 7 = 18\text{£. } 12\text{s. } 9\text{d.}$ Ans.
27. $\$49.00 \div 3 = \$16.33\frac{1}{3}$; $\$16.33\frac{1}{3} \div 11 = \$1.48\frac{1}{3}$; $\$1.48\frac{1}{3} \times 81 = \$120.27\frac{1}{3}$ Ans.
28. $\$78.80 \div 11 = \$7.16\frac{4}{11}$; $\$7.16\frac{4}{11} \div 9 = \$0.79\frac{4}{9}$; $\$0.79\frac{4}{9} \times 31 = \$24.67\frac{4}{9}$ Ans.

29. $37\text{£. } 18\text{s. } 10\text{d.} \div 3 = 12\text{£. } 12\text{s. } 11\frac{1}{2}\text{d.}$; $12\text{£. } 12\text{s. } 11\frac{1}{2}\text{d.} + 8 = 1\text{£. } 11\text{s. } 7\frac{1}{2}\text{d.}$; $1\text{£. } 11\text{s. } 7\frac{1}{2}\text{d.} \times 43 = 67\text{£. } 19\text{s. } 6\frac{1}{2}\text{d.}$ Ans.
30. $\$40 \div 5 = \$8.00$; $\$8.00 \div 7 = \$1.14\frac{2}{7}$; $\$1.14\frac{2}{7} \times 137 = \$156.57\frac{1}{7}$ Ans.
31. $\$360 \div 20 = \$18$; $\$18 \div 6 = \$3$; $\$3 \times 263 = \$789$ Ans.
32. $\$8.75 \div 7 = \$1.25$; $\$1.25 \div 11 = \$0.11\frac{4}{11}$; $\$0.11\frac{4}{11} \times 205 = \$23.29\frac{4}{11}$ Ans.
33. $\$19.80 \div 3 = \$6.60$; $\$6.60 \div 7 = \$0.94\frac{2}{7}$; $\$0.94\frac{2}{7} \times 81 = \$76.37\frac{1}{7}$ Ans.
35. $3\text{cwt.} \div 151 = \frac{3}{151}$; $\frac{3}{151} \times \frac{1}{1} = \frac{3}{151}$; $\frac{3}{151} \times \frac{1}{1} = \frac{3}{151}$ Ans.
36. $\$276.18 \div 24 = \$11.50\frac{3}{4}$; $\$11.50\frac{3}{4} \times 7 = \$80.55\frac{1}{4}$; $\$80.55\frac{1}{4} \times 75 = \$6041.43\frac{3}{4}$ Ans.
37. $\$875.00 \div 81 = \$10.80\frac{2}{9}$; $\$10.80\frac{2}{9} \times 11 = \$118.82\frac{2}{9}$; $\$118.82\frac{2}{9} \times 75 = \$8912.03\frac{1}{3}$ Ans.
38. $\$70 \div 35 = \$2$; $\$2 \times 8 = \$16$; $\$16 \times 86 = \$1376$ Ans.
39. $\$375.00 \div 111 = \$3.37\frac{2}{111}$; $\$3.37\frac{2}{111} \times 4 = \$13.51\frac{2}{111}$; $\$13.51\frac{2}{111} \times 69 = \$932.43\frac{2}{11}$ Ans.
40. $\$80.50 \div 23 = \$3.50$; $\$3.50 \times 5 = \$17.50$; $\$17.50 \times 15 = \$262.50$ Ans.
41. $\$62.37 \div 81 = \$0.77$; $\$0.77 \times 11 = \$8.47$; $\$8.47 \times 19 = \$160.93$ Ans.
43. $\$668.50 \div 191 = \$3.50$; $\$3.50 \times 11 = \$38.50$; $\$38.50 \div 5 = \$7.70$; $\$7.70 \times 449 = \$3457.30$ Ans.
44. $\$1738 \div 79 = \$22$; $\$22 \times 4 = \$88$; $\$88 \div 11 = \$8$; $\$8 \times 411 = \$3288$ Ans.
45. $1128\text{ft.} \div 47 = 24$; $24 \times 4 = 96$; $96 \div 8 = 12$; $8 \times 1435 = 11480$ feet, Ans.
46. $116\text{cwt.} \div 29 = 4$; $4 \times 8 = 32$; $32 \div 4 = 8$; $8 \times 47 = 376\text{cwt.}$ Ans.
47. $376 \div 47 = 8$; $8 \times 4 = 32$; $32 \div 8 = 4$; $4 \times 29 = 116\text{cwt.}$ Ans.

48. $\$8 \div 10 = \frac{4}{5}$; $\frac{4}{5} \times \frac{7}{1} = \frac{28}{5}$; $\frac{28}{5} \times \frac{1}{4} = \frac{7}{5}$; $\frac{7}{5} \times \frac{35}{1} =$
 $\$49$ Ans.
49. $\$414 \div 207 = \$2$; $\$2 \times 10 = \$20$; $\$20 \div 5 = \$4$;
 $\$4 \times 59 = \$236$ Ans.

MISCELLANEOUS QUESTIONS BY ANALYSIS.

1. (p. 179.) $\$896.50 \div 11 = \$81.50$; $\$81.50 \times 10 =$
 $\$815$ Ans.
2. $\$17\frac{3}{11} \div 3 = \$5\frac{3}{11}$; $\$5\frac{3}{11} \times 37 = \$213.03\frac{3}{11}$ Ans.
3. $\$3687 \div 8 = \$460.87\frac{1}{2}$; $\$460.87\frac{1}{2} \times 7 = \$3226.12\frac{1}{2}$ Ans.
4. $17\frac{7}{12} = 21\frac{1}{12}$; $187\frac{3}{8} = 149\frac{3}{8}$; $149\frac{3}{8} \div 21\frac{1}{12} = \frac{1499}{8} \times$
 $\frac{3}{2} = \frac{122}{211} = \frac{4427}{4222}$; $\frac{4427}{4222} \times \frac{1}{4} = \frac{22421}{29554} = \$7.61\frac{253}{1177}$ Ans.
5. $\$13\frac{7}{8} = 11\frac{1}{8}$; $11\frac{1}{8} \times \frac{1}{8} = 1\frac{1}{8} = \$30.52\frac{1}{2}$ Ans.
6. $\$37\frac{3}{11} = 41\frac{10}{11}$; $41\frac{10}{11} \div 100 = \frac{41}{110}$; $\frac{41}{110} \times \frac{1}{4} = \frac{41}{440} =$
 $\$0.21\frac{1}{44}$ Ans.
7. $\$0.12 \times \frac{1}{4} = \frac{12}{400}$; $48\frac{7}{13} = \frac{631}{13}$; $\frac{12}{400} \times \frac{631}{13} = \frac{2082}{1300}$
 $= \$16.01\frac{1}{13}$ Ans.
8. $\$3\frac{2}{7} = 2\frac{2}{7}$; $6\frac{2}{5} = \frac{32}{5}$; $2\frac{2}{7} \times \frac{2}{5} = \frac{207}{28}$; $\frac{207}{28} \times \frac{22}{5} = \frac{8831}{140}$
 $= \$48\frac{11}{140}$ Ans.
9. $\$236 \div 11\frac{1}{2} = \frac{236}{1} \times \frac{5}{23} = \$20$; $\$20 \times 20\frac{7}{10} = \$414$
 [Ans.]
10. $97\frac{1}{4} \div 3 = 32\frac{1}{12}$; $1073\frac{3}{4} \div 32\frac{1}{12} = \frac{7513}{7} \times \frac{3}{688} = 33$
 bales, Ans.
11. $\$48\frac{11}{10} \div 6\frac{2}{5} = \frac{6831}{140} \div \frac{22}{5} = \frac{6831}{140} \times \frac{5}{22} = \frac{207}{28}$; $\frac{207}{28}$
 $\times \frac{4}{9} = 2\frac{2}{3} = \$3.28\frac{1}{3}$ Ans.

12. $34 \div 3\frac{2}{3} = 34 \times \frac{3}{11} = 10\frac{2}{11}$; $10\frac{2}{11} \times 74\frac{1}{2} = \frac{102}{11} \times \frac{149}{2}$
 $= 141\frac{2}{11} = \$6.90\frac{2}{11}$ Ans.
13. $\$63 \div 2\frac{1}{2} = 63 \div 1\frac{1}{2} = \frac{63}{1} \times \frac{2}{3} = 42$; $\frac{441}{19} \times \frac{148}{9} =$
 $129\frac{2}{3} = \$381\frac{2}{3}$ Ans.
14. $\$17\frac{1}{11} \div (3 \times 3) = \$17\frac{1}{11} \div 9 = \$1\frac{8}{11}$; $\$1\frac{8}{11} \times 4 =$
 $\$7\frac{1}{3}$ Ans.
15. $\$31\frac{1}{4} = 22\frac{1}{4}$; $2\frac{1}{2} = 1\frac{1}{2}$; $22\frac{1}{4} \div 1\frac{1}{2} = \frac{221}{7} \times \frac{6}{11} = 17$;
 $689\frac{4}{5} = 226\frac{1}{5}$; $\frac{78}{7} \times \frac{8961}{13} = 527\frac{2}{3} = \$7680\frac{2}{3}$ Ans.
16. $\$63 \div 6\frac{2}{3} = \frac{63}{1} \div \frac{20}{3} = \frac{63}{1} \times \frac{3}{20} = 1\frac{18}{20}$; $\frac{189}{20} \times \frac{18}{1} =$
 $170\frac{1}{10} = \$170.10$ Ans.
17. $\$243\frac{1}{11} = 221\frac{4}{11}$; $\frac{28}{1} \div 221\frac{4}{11} = \frac{96}{1} \times \frac{11}{2674} = 1\frac{28}{1337}$;
 $\$1000 \times 1\frac{28}{1337} = 394\frac{1228}{1337}$ barrels, Ans.
18. $83\frac{2}{5} = 133\frac{2}{5}$; $\$7888.30 \div 133\frac{2}{5} = \frac{788830}{1} \times \frac{16}{1337} =$
 $\$94.40$; $\$94.40 \times 7 = \$660.80$ Ans.
19. $132\text{c. } 12\text{s.} = 2652\text{s.}$; $7\frac{1}{2} = \frac{15}{2}$; $12\frac{1}{2} = \frac{25}{2}$; $2652\text{s.} \div$
 $\frac{15}{2} = \frac{2652}{1} \times \frac{9}{68} = 351\text{s.}$; $\frac{351}{1} \times \frac{115}{9} = 4485\text{s.} =$
 $224\text{c. } 5\text{s.}$ Ans.
20. $17\frac{2}{3} = \frac{52}{3}$; $89\frac{1}{3} = 268\frac{1}{3}$; $\$25.44 \div \frac{52}{3} = \frac{2544}{1} \times \frac{3}{52} =$
 $\$144$; $\frac{144}{1} \times \frac{268}{3} = \$128.64$ Ans.

$$21. 7\frac{1}{2} = 7\frac{1}{2}; 19\frac{1}{2} = 23\frac{3}{4}; \$7.28 \div \frac{1}{2} = \frac{7.28}{1} \times \frac{12}{91} =$$

$$\$0.96; \$0.96 \times 23\frac{3}{4} = \$19.12 \text{ Ans.}$$

$$22. 49\frac{1}{2} = 24\frac{1}{2}; 37\frac{1}{2} = 23\frac{1}{2}; \$4355.52 \div 24\frac{1}{2} = \frac{4355.52}{1} \times$$

$$\frac{7}{1248} = \$87.36; \frac{87.36}{1} \times \frac{264}{7} = \$3294.72 \text{ Ans.}$$

$$23. \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}; \$300,000 \div 3 = \$100,000; \$100,000 \times$$

$$20 = \$2,000,000 \text{ Ans.}$$

$$24. 7\frac{1}{2} = 7\frac{1}{2}; 19\frac{1}{2} = 7\frac{1}{2}; \$135.80 \div 7\frac{1}{2} = \frac{135.80}{1} \times \frac{13}{91} =$$

$$\$18.20; \frac{18.20}{1} \times \frac{79}{4} = \$359.45 \text{ Ans.}$$

$$25. 6 \text{ cords } 76\text{ft.} = 844\text{ft.}; 7 - \frac{1}{2} = \frac{13}{2}; 4\frac{1}{2} = \frac{9}{2}; 844\text{ft.} \times \frac{1}{2}$$

$$= 244 \times \frac{1}{2} = 237\frac{1}{2}; 237\frac{1}{2} \times \frac{9}{2} = 213\frac{3}{4} = \$23.14\frac{3}{4}$$

Ans.

$$26. 30\text{rd.} \times 30\text{rd.} = 900; 18 + 82 = 100; 900 - 100 = 800;$$

$$\frac{800}{8} = 100 \text{ Ans.}$$

$$27. 7\text{T. } 12\text{cwt. } 3\text{qr. } 18\text{lb.} = 3\text{T. } 18\text{cwt. } 1\text{qr. } 20\text{lb.} = 3\text{T. } 14\text{cwt.}$$

$$1\text{qr. } 26\text{lb.} = 8342\text{lb.}; 2342 \times \frac{1}{2} = 2592\frac{1}{2}; 5\frac{1}{2} = 2\frac{1}{2};$$

$$2592\frac{1}{2} \times \frac{1}{2} = 2592\frac{1}{2} = \$271.71\frac{1}{2} \text{ Ans.}$$

$$28. \$68.50 \times 37 = \$2534.50; \$2534.50 \times \frac{1}{2} = \$1900.87\frac{1}{2}$$

$$= \text{value of coffee}; \$2534.50 - \$1900.87\frac{1}{2} = \$633.62\frac{1}{2}$$

Ans.

$$29. \frac{1}{2} - \frac{1}{4} = \frac{1}{4}; \$7896 \times \frac{1}{4} = \$1974; \$1974 \times 2 = \$3948$$

Ans.

$$30. 1\frac{1}{2} - 1\frac{1}{3} = \frac{1}{6}; \frac{1}{3} \times \frac{1}{3} = \frac{1}{9}; \frac{1}{3} - \frac{1}{9} = \frac{2}{9}; \$88$$

$$\times \frac{2}{9} = \frac{8800}{9} \times \frac{2}{9} = \frac{88000}{9} = \$37.49\frac{1}{9} \text{ Ans.}$$

$$31. \frac{1}{2} - \frac{1}{4} = \frac{1}{4}; \frac{1}{4} \times \frac{2}{3} = \frac{1}{6}; \frac{1}{2} - \frac{1}{6} = \frac{1}{3}; \frac{1}{12} \times \frac{3}{4} = \frac{1}{16} =$$

$$\$750; \frac{1}{16} = \$750 \times 16 = \$12,000 \text{ Ans.}$$

DECIMAL FRACTIONS.

NOTATION OF DECIMAL FRACTIONS.

(ART. 181, p. 183.)		7.	75.9
1.	307.25	8.	2000.002
2.	47.7	9.	18.018
3.	18.05	10.	505.001006
4.	29.003	11.	300.0000042
5.	.0049	12.	2500.000000037
6.	8.000008	or 2500.00000000037	

ADDITION OF DECIMALS.

(ART. 183, p. 184.)

(2.)	(3.)	(4.)
171.61111	.16711	151.01
16.7101	1.766	611111.01
.00007	76111.1	16.5
71.0006	167.1	6.7
1.167895	.000007	46.1
<u>260.489775</u>	1476.1	.67896
	<u>77756.233117</u>	<u>611331.99896</u>
(5.)	(6.)	(7.)
56000.014	49.0105	3.0018
19.19	89.107	1005.023043
57.0048	.000127	87.107
23005.4	.0048	.0049
.000014	138.122427	<u>47000.00309</u>
<u>79081.608814</u>		<u>48095.139833</u>

SUBTRACTION OF DECIMALS.

(ART. 184, p. 185.)

(5.)	(6.)	(7.)	(8.)	(9.)
81.35	1.	100.	87.1	100.
11.678956	.876543	99.111176	5.6789	.001
<u>69.671044</u>	<u>.123457</u>	<u>.888824</u>	<u>81.4211</u>	<u>99.999</u>

(10.)	(11.)	(12.)	(13.)	(14.)
73.	365.	357000.	.875	.3125
.073	.0047	28.0004009	.4	.125
<u>72.927</u>	<u>364.9953</u>	<u>356971.9995991</u>	<u>.475</u>	<u>.1875</u>
(15.)	(16.)	(17.)	(18.)	(19.)
.95	3.7	8.125	9.375	.666
.44	1.8	2.6875	1.5	.041
<u>.51</u>	<u>1.9</u>	<u>5.4375</u>	<u>7.875</u>	<u>.625</u>

MULTIPLICATION OF DECIMALS.

(ART. 185, p. 187.)		6.	1137.
3.	.12649	7.	2.20947
4.	18.58922	8.	.00046967
5.	.00000114	9.	22.09

(10.)	(11.)	(12.)	(13.)
.087	107000.0015	.0097	.096
.000015	.0107	400.67	.00096
<u>.000001305</u>	<u>7490000105</u>	<u>679</u>	<u>576</u>
	1070000015	582	864
	<u>1144.90001605</u>	388	<u>.00009216</u>
		3.886499	

(14.)	(15.)	(16.)	(17.)
1000000.	100.	.101	1050.0007
.000001	.0014	.10101	.00305
<u>1.</u>	<u>400</u>	<u>101</u>	<u>52500035</u>
	100	101	31500021
	<u>.14</u>	101	<u>3.202502135</u>
		.01020201	

(18.)	(19.)	(20.)
2000000.	400.004	\$ 1.125
.7	30.03	46.
<u>1400000.</u>	<u>1200012</u>	<u>6750</u>
	1200012	4500
	<u>12012.12012</u>	<u>\$ 51.75</u>

(21.)	(22.)	(23.)
Tons 17.125	\$.125	375.25
\$ 18.875	18.	\$ 0.62
85625	1000	75050
119875	125	225150
137000	\$ 2.250	\$ 232.6550
137000		
17125		
<u>\$ 323.234375</u>		

DIVISION OF DECIMALS.

3. (ART. 186, p. 189.) .375	7.	.0144
4. 2.069	8.	9.784
5. 1930.51	9.	125.36
6. .069255	10.	148.939 +

(11.)	(12.)	(13.)
1.2)172.8(144.	.12)1728(14400.	.12).1728(1.44

(14.)	(15.)	(16.)
12)1.728(.144	1.2)17.28(14.4	.0012)1728(1440000.

(17.)	(18.)	(19.)
12).001728(.000144	9.7)147.828(15.24	.328).678767(2.069 +

(20.)	(21.)
5.428)75.16(13.846 +	31.076)4.01020304(.127045 +

REDUCTION OF DECIMALS.

(ART. 187, p. 190.)

(2.)	(3.)	(4.)
4)3.00	8)7.000	16)7.0000
.75	.875	.4375
(5.)	(6.)	(7.)
11)4.000000	12)5.000000	17)4.000000
.363636 +	.416666 +	.235294 +

(ART. 188, p. 191.)

$$\begin{array}{r|l} (2.) & \\ 12 & 6.0 \\ 20 & 15.5 \\ \hline & .775 \end{array}$$

$$\begin{array}{r|l} (3.) & \\ 28 & 14.0 \\ 4 & 2.500 \\ 20 & 5.6250 \\ \hline & .28125 \end{array}$$

$$\begin{array}{r|l} (4.) & \\ 28 & 21.00 \\ 4 & 3.7500 \\ \hline & .9375 \end{array}$$

$$\begin{array}{r|l} (5.) & \\ 40 & 8.0 \\ 8 & 6.200 \\ \hline & .775 \end{array}$$

$$\begin{array}{r|l} (6.) & \\ 144 & 72.0 \\ 272\frac{1}{2} & 167.5 \\ 40 & 19.615243 \\ 4 & 3.490381 \\ \hline & .872595 + \end{array}$$

(ART. 189, p. 192.)

$$\begin{array}{r} (1.) \\ .628125 \\ 20 \\ \hline 12.562500 \\ 12 \\ \hline 6.750000 \\ 4 \\ \hline 3.000000 \end{array}$$

Ans. 12s. 6 $\frac{1}{2}$ d.

$$\begin{array}{r} (2.) \\ .778125 \\ 20 \\ \hline 15.562500 \\ 4 \\ \hline 2.250000 \\ 28 \\ \hline 7.000000 \end{array}$$

Ans. 15cwt. 2qr. 7lb.

$$\begin{array}{r} (3.) \\ .75 \\ 5 \\ \hline 3.75 \\ 4 \\ \hline 3.00 \\ 28 \end{array}$$

Ans. 3qr. 3na.

$$\begin{array}{r} (4.) \\ .965625 \\ 8 \\ \hline 7.725000 \\ 40 \\ \hline 29.000000 \end{array}$$

Ans. 7fur. 29rd.

$$\begin{array}{r} (5.) \\ .94375 \\ 4 \\ \hline 3.77500 \\ 40 \\ \hline 31.00000 \end{array}$$

Ans. 3R. 31p.

$$\begin{array}{r} (6.) \\ .815625 \\ 12 \\ \hline 9.787500 \\ 20 \\ \hline 15.750000 \\ 24 \\ \hline 18.000000 \end{array}$$

Ans. 9oz. 15dwt. 18gr.

$$\begin{array}{r} (7.) \\ .5555 \\ 12 \\ \hline 6.6660 \\ 8 \\ \hline 5.3280 \\ 3 \\ \hline .9840 \\ 20 \\ \hline 19.6800 \end{array}$$

Ans. 6 $\frac{3}{4}$ 53 0 $\frac{1}{2}$ 19 $\frac{1}{4}$ gr.

EXERCISES IN DECIMALS.

$$\begin{array}{r}
 (1.) \\
 28 \overline{) 14.0} \\
 4 \overline{) 3.500} \\
 \underline{15.875} \\
 \$ 9.50 \\
 \underline{793750} \\
 142875 \\
 \hline
 \$ 150.81,250
 \end{array}$$

$$\begin{array}{r}
 (2.) \\
 28 \overline{) 7.00} \\
 4 \overline{) 1.2500} \\
 20 \overline{) 18.3125} \\
 \underline{17.915625} \\
 \$ 53.80 \\
 \underline{1433250000} \\
 53746875 \\
 89578125 \\
 \hline
 \$ 963.86,0625
 \end{array}$$

3. $16 \div 40 = .4$; $3 + .4 = 3.4$; $3.4 \div 4 = .85$; $37 + .85 = 37.85$; $37.85 \times \$ 75.16 = \$ 2844.80,6$ Ans.

4. $2 \div 4 = .5$; $3 + .5 = 3.5$; $3.5 \div 4 = .875$; $15 + .875 = 15.875$; $15.875 \times \$ 3.75 = \$ 59.53,125$ Ans.

5. $15.375 \times \$ 4.62,5 = \$ 71.10,9375$ Ans.

6. $36 \div 40 = .9$; $6 + .9 = 6.9$; $6.9 \div 8 = .8625$; $17 + .8625 = 17.8625$; $17.8625 \times \$ 3765.60 = \$ 67263.03$ Ans.

7. $21 \div 63 = .333 +$; $27 + .333 + = 27.333 +$; $27.333 + \times \$ 15.375 = \$ 420.24,4875 +$ Ans.

8. $9 \div 12 = .75$; $18 + .75 = 18.75$; $6 \div 12 = .5$; $4 + .5 = 4.5$; $3 \div 12 = .25$; $7 + .25 = 7.25$; $18.75 \times 4.5 \times 7.25 = 611.71875$ feet; $.71875 \times 1728 = 1242$ inches. Ans. 611ft. 1242in.

9. $6 \div 12 = .5$; $12 + .5 = 12.5$; $9 \div 12 = .75$; $2 + .75 = 2.75$; $12.5 \times 2.75 = 34.375$ feet; $.375 \times 144 = 54$ inches. Ans. 34ft. 54in.

10. $1 \div 2 = .5$; $3 + .5 = 3.5$; $3.5 \div 4 = .875$; $25 + .875 = 25.875$; $25.875 \times \$.375 = \$ 9.70,3125$ Ans.

11. $30 \div 40 = .75$; $3 + .75 = 3.75$; $3.75 \div 4 = .9375$; $144 + .9375 = 144.9375$; $144.9375 \times \$ 97.625 = \$ 14149.52,34375$ Ans.

12. $21 \div 28 = .75$; $.75 \div 4 = .1875$; $18 + .1875 = 18.1875$; $18.1875 \div 20 = .909375$; $3 + .909375 =$

- 3.909375 ; $3.909375 \times \$ 9.375 = \$ 36.65,0390625$;
 $\$ 36.65,0390625 - \$ 20.25 = \$ 16.40 + \text{Ans.}$
 13. $\$ 5.50 \div 7 = \$.784$; $\$.784 \times 8 = \$ 6.284$; $\$ 6.284 \times 7.75 = \$ 48.71,424 \text{ Ans.}$
 14. $\$ 12\frac{3}{4} = \$ 12.625$; $4\frac{1}{2} = 4.75$; $\$ 12.625 \div 4.75 = 2.657894 +$; $2.657894 + \times 17.375 = \$ 46.18,09 + \text{Ans.}$
-

REDUCTION OF CURRENCIES.

2. (ART. 191, p. 194.) $144\text{£. } 7\text{s. } 6\text{d.} = 144.375\text{£.}$;
 $144.375\text{£.} \div \frac{3}{10}\text{£.} = \$ 481.25 \text{ Ans.}$ [Ans.
 3. $74\text{£. } 1\text{s. } 6\text{d.} = 74.075\text{£.}$; $74.075\text{£.} \div \frac{3}{4}\text{£.} = \$ 185.18\frac{1}{2}$,
 4. $129\text{£.} \div \frac{3}{8}\text{£.} = \$ 344 \text{ Ans.}$
 5. $144\text{£. } 6\text{s. } 3\text{d. } 2\text{qr.} = 144.31458 + \text{£.}$; $144.31458 + \text{£.} \div \frac{1}{2}\text{£.} = \$ 288.62,9 \text{ Ans.}$
 6. $84\text{£.} \div \frac{7}{10}\text{£.} = \$ 360 \text{ Ans.}$
 7. $144\text{£. } 4\text{s.} = 144.20\text{£.}$; $144.20\text{£.} \div \frac{1}{4}\text{£.} = \$ 576.80, \text{Ans.}$
 8. $257\text{£. } 8\text{s. } 6\text{d.} = 257.425\text{£.}$; $257.425\text{£.} \div \frac{3}{121}\text{£.} = \$ 1245.93,7 \text{ Ans.}$
 2. (ART. 192, p. 195.) $\$ 481.25 \times \frac{3}{10} = 144.375\text{£.} = 144\text{£. } 7\text{s. } 6\text{d.} \text{ Ans.}$
 3. $\$ 185.18\frac{1}{2} \times \frac{3}{4} = 74.075\text{£.} = 74\text{£. } 1\text{s. } 6\text{d.} \text{ Ans.}$
 4. $\$ 344 \times \frac{3}{8} = 129\text{£.} \text{ Ans.}$
 5. $\$ 288 \times \frac{1}{2} = 144\text{£.} \text{ Ans.}$
 6. $\$ 360 \times \frac{7}{10} = 84\text{£.} \text{ Ans.}$
 7. $\$ 576.50 \times \frac{1}{4} = 144.125\text{£.} = 144\text{£. } 2\text{s. } 6\text{d.} \text{ Ans.}$
 8. $\$ 1245.93,7 \times \frac{3}{121} = 257.425\text{£.} = 257\text{£. } 8\text{s. } 6\text{d.} \text{ Ans.}$
-

PERCENTAGE.

- | | | | |
|------------------------|--------------|----|--------------|
| 2. (ART. 194, p. 197.) | $\$ 6.50$ | 5. | 57.375 tons. |
| 3. | $\$ 39.45$ | 6. | $\$ 490$ |
| 4. | $\$ 51.38,9$ | 7. | $\$ 15.12$ |

8. 26.415 yards. | 10. 29.44 yards.
 9. \$ 877.50 | 11. \$ 8500
 12. \$ 100 $\times$ 25 = \$ 2500; \$ 2500 $\times$.12 = \$ 300 Ans.
 13. \$ 25 $\times$ 1728 = \$ 43200; \$ 43200 $\times$.15 = \$ 6480 Ans.
 14. 5000 $\times$ \$ 1.25 = \$ 6250; \$ 5000 $\times$.25 = 1250; 5000 —
 1250 = 3750; 3750 $\times$ \$ 2 = \$ 7500; \$ 7500 —
 \$ 6250 = \$ 1250 Ans.
 15. \$ 8000 $\times$.19 = \$ 1520; \$ 8000 — \$ 1520 = \$ 6480,
 \$ 6480 $\times$.37 = \$ 2397.60; \$ 6480.00 — \$ 2397.60 =
 \$ 4082.40; \$ 4082.40 — \$ 2000 = \$ 2082.40 Ans.
 16. \$ 100 $\times$.15 = \$ 15; \$ 100 — \$ 15 = \$ 85; \$ 85 $\times$ 17
 = \$ 1445; \$ 100 + \$ 15 = \$ 115; \$ 115 $\times$ 17 =
 \$ 1955; \$ 1955 — \$ 1445 = \$ 510 Ans.

(17.)

$$1\frac{1}{2} = 1.75$$

$$1.75 \times .95 = 1.6625$$

$$10 \div 1.6625 = 6\frac{2}{3} = 6\frac{2}{3}$$

$$6\frac{2}{3} \times 1\frac{1}{2} = 10\frac{1}{3}$$

$$12635)80000(6\text{yd.}$$

$$\underline{75810}$$

$$4190$$

$$\underline{4}$$

$$12635)16760(1\text{qr.}$$

$$\underline{12635}$$

$$4125$$

$$\underline{4}$$

$$12635)16500(1\frac{1}{2}\text{na.}$$

$$\underline{12635}$$

$$3865$$

Ans. 6yd. 1qr. $1\frac{1}{2}\frac{1}{2}$ na.

SIMPLE INTEREST.

(Art. 197, p. 200.)

2.	\$ 0.08,1	8.	\$ 0.25,0 $\frac{1}{2}$
3.	\$ 0.10,7	9.	\$ 0.02,0 $\frac{1}{2}$
4.	\$ 0.22,3 $\frac{1}{2}$	10.	\$ 1.02,0 $\frac{1}{2}$
5.	\$ 0.12,8 $\frac{1}{2}$	11.	\$ 1.31,9 $\frac{1}{2}$
6.	\$ 0.42,2 $\frac{1}{2}$	12.	\$ 1.20,0 $\frac{1}{2}$
7.	\$ 0.01,9 $\frac{1}{2}$	13.	\$ 2.11,5 $\frac{1}{2}$

(ART. 198, p. 201.)			
2.	\$ 11.82	13.	\$ 1.24,8
3.	\$ 311.04	14.	\$ 0.20,5
4.	\$ 8.28	15.	\$ 50.01,6
5.	\$ 155.52	16.	\$ 0.03,1
6.	\$ 1.68,7	17.	\$ 55.60,7
7.	\$ 17.72,2	18.	\$ 149.77,6
8.	\$ 8.25,8	19.	\$ 7.20,5
9.	\$ 90.83,5	20.	\$ 1.05,7
10.	\$ 1110.23,4	21.	\$ 8.79,7
11.	\$ 88.39,9	22.	\$ 7.23
12.	\$ 122.71,5	23.	\$ 1661.37,6

1. (ART. 199, p. 203.) \$10.08			
2.	\$ 97.18	9.	\$ 14.15,1
3.	\$ 231.29,9	10.	\$ 33.97,9
4.	\$ 78.41,4	11.	\$ 16.45,0
5.	\$ 446.92,9	12.	\$ 13.91
6.	\$ 0.84,9	13.	\$ 209.82
7.	\$ 430.36	14.	\$ 1183.18
8.	\$ 137.92,2	15.	\$ 21.03,7
		16.	\$ 388.94

(ART. 200, p. 204.)			
2.	\$ 745.50	7.	\$ 2163.19,9
3.	\$ 207.27	8.	\$ 274.77,5
4.	\$ 19.71,3	9.	\$ 131.99
5.	\$ 61.75,4	10.	\$ 253.11,9
6.	\$ 1.86,8	11.	\$ 95.02,8
		12.	\$ 1904.12,1

(2.) (ART. 201, p. 205.)

26£. 10s. = 26.50£.
Interest of 1£. = .14

10600
2650
6)3.7100
6183½

3.0916½
(Carried up.)

(Brought up.)

3.0916½
20
1.8333½
12
10.0000

3£. 1s. 10d. Ans.

(3.)	(4.)
42£. 18s. = 42.90£.	94£. 12s. 6d. = 94.625£.
Interest of 1£. = .109½	Interest of 1£. = .271½
38610	94625
4290	662375
715	189250
4.68325	15770
20	2 = ½)25.659145
13.66500	8.553048
12	34.212193
7.98	20
4	4.243860
3.92	12
4£. 13s. 7½d. Ans.	2.92632
	4
	3.70528
	34£. 4s. 2½d. Ans.

(5.)	(Brought up.)
110£. 7s. 6d. = 110.375£.	Interest = 38.171352½
Interest of 1£. = .415	110.375
551875	Amount = 148.546
110375	20
441500	10.920
6)45.805623	12
7.634270½	11.040
Interest = 38.171352½	
(Carried up.)	148£. 10s. 11d. Ans.

MISCELLANEOUS EXERCISES IN INTEREST.

(PAGE 206.)

NOTE. When the required interest is more or less than 6 per cent., we may first find the interest at 6 per cent. by the foregoing Rules, then divide this interest by 6, and the quotient will be the interest of the required sum at 1 per cent. Then, if we multiply the 1 per cent. by the required per cent. we obtain the answer. Or the pupil, if he please, can perform the following questions by Article 200.

KEY TO

(1.)

y.	mo.	d.
1842	6	9
1840	8	25
1	9	14

\$ 172.50
 .107½
 120750
 17250
 5750
 \$ 18.51,500

(4.)

y.	mo.	d.
1841	11	11
1839	3	7
2	8	4

\$ 67.07
 .160½
 402420
 6707
 4471
 \$ 10.77,591

(7.)

y.	mo.	d.
1842	1	11
1841	2	1
11	10	

\$ 7.18
 .056½
 4308
 3590
 478
 \$.40,686

(2.)

y.	mo.	d.
1841	4	5
1838	11	10
2	4	25

169.75
 .144½
 67900
 67900
 16975
 2829
 \$ 24.47,229

(5.)

y.	mo.	d.
1841	11	19
1839	0	7
2	11	12

\$ 117.75
 .177
 82425
 82425
 11775
 \$ 20.84,175

(8.)

y.	mo.	d.
1845	10	25
1842	4	29
3	5	26

\$ 976.18
 .209½
 878562
 195236
 32539
 \$ 204.34,701

(3.)

y.	mo.	d.
1841	8	1
1837	6	29
4	1	2

\$ 17.18
 .245½
 8590
 6872
 3436
 572
 \$ 4.21,482

(6.)

y.	mo.	d.
1843	0	11
1839	9	9
3	3	2

\$ 847.15
 .195½
 423575
 762435
 84715
 28238
 \$ 165.47,663

(9.)

y.	mo.	d.
1842	2	9
1839	6	25
2	7	14

\$ 144
 .157½
 1008
 720
 14448
 22.656
 144
 \$ 166.65,6

(10.)

y.	mo.	d.
1842	0	1
1840	0	19
1	11	12

\$ 375.83

.117

263081

37583

37583

43.97,211

375.83

419.80,211

79.33,918

\$ 499.14,129

y.	mo.	d.
1842	0	1
1841	3	23
8	8	

\$ 76.19

.041 $\frac{1}{2}$

7619

30476

2539

3.14,918

76.19

\$ 79.33,918

(11.)

y.	mo.	d.
1841	5	11
1840	5	5
1	0	6

\$ 68.19

.061

6819

40914

6)4.15,959

.69,326

\$ 4.85,285

(12.)

y.	mo.	d.
1842	11	30
1839	1	17
3	10	13

\$ 79.15

.232 $\frac{1}{2}$

15830

23745

15830

1319

6)18.37,599

3.06,2667 $\frac{1}{2}$

21.43,862

1.53,133

22.96,995

79.15

\$ 102.11,995

(13.)

y.	mo.	d.
1841	11	9
1840	5	19
1	5	20

\$ 89.96

.088 $\frac{1}{2}$

71968

71968

2998

6)7.94,646

1.32,4418 $\frac{1}{2}$

10.59,528

.33,110

10.92,638

89.96

\$ 100.88,638

(14.)

y.	mo.	d.
1841	6	4
1839	5	5
2	0	29

\$ 325.00

.124 $\frac{1}{2}$

130000

65000

32500

27000

6)40.57,000

6.76,1667 $\frac{1}{2}$

47.33,162

1.69,041

49.02,203

325.

\$ 874.02,203

KEY TO

(15.)

y.	mo.	d.
1842	9	9
1839	11	29
2	9	10

\$ 1728
 .166 $\frac{2}{3}$
 10368
 10368
 1728
 1152
 6)288.000
 48.000
 9
 432.000
 1728.
 \$ 2160.000

(16.)

y.	mo.	d.
1842	6	4
1841	0	29
1	5	5

\$ 976.18
 .085 $\frac{1}{2}$
 488090
 780944
 81348
 83.78,878
 2
 \$ 167.57,756

(17.)

y.	mo.	d.
1843	8	7
1839	5	19
4	2	18

\$ 176.17
 .253
 52851
 88085
 35234
 6)44.57,101
 7.42,850
 9 $\frac{1}{2}$
 66.85,650
 5.57,137
 \$ 72.42,787

(18.)

y.	mo.	d.
1847	7	23
1808	11	3
38	8	20

\$ 379.78
 2.323 $\frac{1}{2}$
 113934
 75956
 113934
 75956
 12659
 6)882.35,553
 147.05,925
 7 $\frac{1}{2}$
 1029.41,475
 110.29,443
 1139.70,918
 379.78
 \$ 1519.48,918

(19.)

y.	mo.	d.
1843	8	25
1841	4	7
2	4	18

\$ 175.08
 .143
 52524
 70032
 17508
 6)25.03,644
 4.17,274
 29.20,918
 175.08
 \$ 204.28,9

(20.)

y.	mo.	d.
1844	8	9
1843	11	11
8	28	

\$ 160
 .044 $\frac{2}{3}$
 640
 640
 106
 6)7.14,6
 1.19,1
 8.33,7
 160
 \$ 168.33,7

PARTIAL PAYMENTS.

(ART. 203, p. 208.)

(2.)

Principal, ...	\$ 987.75
Interest for 9 months, 2 days, ...	44.77
Amount, ...	\$ 1032.52
First payment, ...	\$ 300.00
Interest for 7 months, 12 days, ...	11.10
Second payment, ...	400.00
Interest for 6 months, 8 days, ...	12.53
Third payment, ...	150.00
Interest for 2 months, 18 days, ...	1.95
	\$ 875.58
Balance remains due Dec. 13, 1842, ...	\$ 156.94

y. mo. d.	y. mo. d.	y. mo. d.	y. mo. d.
1842 11 13	1842 11 13	1842 11 13	1842 11 13
1842 0 11	1842 4 1	1842 5 5	1842 8 25
<u>11 2</u>	<u>7 12</u>	<u>6 8</u>	<u>2 18</u>
2 0			
<u>9 2</u>			
\$ 987.75	\$ 300	\$ 400	\$ 150
.045½	.037	.031½	.013
<u>493875</u>	<u>2100</u>	<u>400</u>	<u>450</u>
395100	900	1200	150
<u>32925</u>		<u>133</u>	
\$ 44.77,800	\$ 11.10,0	\$ 12.53,3	\$ 1.95,0

(3.)

Principal, ...	\$ 800.00
Interest for 10 months, 27 days, ...	43.60
Amount, ...	\$ 843.60
First payment, ...	\$ 144.00
Interest for 9 months, 21 days, ...	6.98
Second payment, ...	90.00
Interest for 7 months, ...	3.15
Amounts carried forward, ...	\$ 244.13 \$ 843.60

KEY TO

Amounts brought forward,	\$ 244.13	\$ 843.60
Third payment,	400.00	
Interest for 5 months,	10.00	
Fourth payment,	100.00	
Interest for 2 months, 27 days,	1.45	
		<u>\$ 755.58</u>

Remains due June 1, 1843, ... \$ 88.02

y.	mo.	d.	y.	mo.	d.	y.	mo.	d.
1843	5	1	1843	5	1	1843	5	1
1842	6	4	1842	7	10	1842	10	1
<u>10 27</u>			<u>9 21</u>			<u>7 0</u>		

\$ 800	\$ 144	\$ 90
.054 $\frac{1}{2}$	.048 $\frac{1}{2}$	.035
<u>3200</u>	<u>1152</u>	<u>450</u>
4000	576	270
400	72	
<u>\$ 43.60,0</u>	<u>\$ 6.98,4</u>	<u>\$ 3.15,0</u>

y.	mo.	d.	y.	mo.	d.
1843	5	1	1843	5	1
1843	0	1	1843	2	4
	5	0		2	27
	\$ 400			\$ 100	
	.025			.014 $\frac{1}{2}$	
	2000			400	
	800			100	
	\$ 10.00,0			50	
				\$ 1.45,0	

(ART. 204, p. 210.)

(2.)

Principal, carrying interest from June 5, 1838,	\$ 1666.00
Interest from June 5, 1838, to January 1, 1841,	
30 months, 26 days,	257.11
Amount carried forward,	<u>\$ 1923.11</u>

Amount brought forward,	\$ 1923.11
First payment, July 4, 1839, a sum less than the interest,	\$ 100.00
Second payment, Jan. 1, 1840, a sum less than the interest,	10.00
Third payment, July 4, 1840, a sum less than the interest,	15.00
Fourth payment, Jan. 1, 1841, a sum lar- ger than the interest,	<u>500.00</u>
	625.00
	<u>1298.11</u>
Interest from Jan. 1, 1841, to Feb. 7, 1842, 13 months, 6 days,	85.67
	<u>Amount,</u> 1383.78
Fifth payment, Feb. 7, 1842,	<u>656.00</u>
	727.78
Interest from Feb. 7, 1842, to Jan. 1, 1843, 10 months, 24 days,	39.30
Remains due Jan. 1, 1843,	<u>\$ 767.08</u>

(3.)

Principal on interest from Oct. 23, 1840,	\$ 960.00
Interest from Oct. 23, 1840, to Sept. 25, 1841, 11 months, 2 days,	61.97
	<u>Amount,</u> 1021.97
First payment, Sept. 25, 1841,	<u>140.00</u>
New principal, carrying interest from Sept. 25, 1841,	881.97
Interest from Sept. 25, 1841, to July 7, 1842, 9 months, 12 days,	48.36
	<u>Amount,</u> 930.33
Second payment, July 7, 1842,	<u>80.00</u>
New principal, carrying interest from July 7, 1842,	850.33
Interest from July 7, 1842, to Dec. 9, 1842, 5 months, 2 days,	25.13
Amount carried forward,	<u>\$ 875.46</u>

KEY TO

Amount brought forward,	\$ 875.46
Third payment, Dec. 9, 1842,	70.00
New principal, carrying interest from Dec. 9, 1842,	805.46
Interest from Dec. 9, 1842, to Nov. 8, 1843,	
10 months, 29 days,	51.52
Amount,	856.98
Fourth payment, Nov. 8, 1842,	100.00
New principal, carrying interest Nov. 8, 1843,	756.98
Interest from Nov. 8, 1843, to Oct. 23, 1844,	
11 months, 15 days,	50.78
Balance due Oct. 23, 1844,	\$ 807.76

(4.)

Principal on interest from March 1, 1839,	\$ 1000.00
Interest from March 1, 1839, to March 1, 1840,	
12 months,	70.00
Amount,	1070.00
First payment, March 1, 1840,	100.00
Principal, carrying interest from March 1, 1840,	970.00
Interest from March 1, 1840, to Sept. 25, 1841,	
18 months, 24 days,	106.37
Amount,	1076.37
Second payment, Sept. 25, 1841,	260.00
Principal carrying interest from Sept. 25, 1841,	876.37
Interest from Sept. 25, 1841, to Oct. 9, 1842,	
12 months, 14 days,	63.73
Amount,	940.10
Third payment, Oct. 9, 1842,	150.00
Principal carrying interest from Oct. 9, 1842,	790.10
Interest from Oct. 9, 1842, to Oct. 9, 1843, 12 months,	55.30
Amount carried forward,	\$ 845.40

Amount brought forward, \$845.40	
Fourth payment, July 4, 1843, a sum less than the interest, ...	\$ 20.00
Fifth payment, Oct. 9, 1843, a sum greater than the interest, ...	<u>300.00</u>
	320.00
Principal carrying interest from Oct 9, 1843, ...	525.40
Interest from Oct. 9, 1843, to Dec. 1, 1844, 13 months, 22 days, ...	<u>42.09</u>
Balance due Dec. 1, 1844, ...	\$ 567.49

(ART. 204, A. p. 211.

(1.)

Principal, ...	\$ 500.00
Interest from July 1, 1844, to Sept. 1, 1845, 14 months, ...	<u>35.00</u>
Amount, ...	535.00
First payment, Sept. 1, 1845, ...	<u>100.00</u>
Balance for new principal, ...	435.00
Interest from Sept. 1, 1845, to Sept. 1, 1846, 1 year, ...	<u>26.10</u>
Amount, ...	461.10
Amount of 2d payment, from April 1, 1846, to Sept. 1, 1846, 5 months, ...	<u>147.60</u>
Balance for new principal, ...	313.50
Interest from Sept. 1, 1846, to Sept. 1, 1847, 1 year, ...	<u>18.81</u>
Amount, ...	332.31
Amount of 3d payment, from Jan. 1, 1847, to Sept. 1, 1847, 8 months, ...	<u>94.12</u>
Balance for new principal, ...	238.19
Interest from Sept. 1, 1847, to Dec. 1, 1848, 15 mo., ...	<u>17.86</u>
Amount, ...	256.05
Fourth payment, ...	<u>168.05</u>
Balance for new principal, ...	88.00
Interest from Dec. 1, 1848, to Oct. 1, 1849, 10 months, ...	<u>4.40</u>
Amount due Oct. 1, 1849, ...	\$ 92.40

PROBLEMS IN INTEREST.

2. (ART. 207, p. 213.) $\$250 \times .0125 = \$3.125$; $\$28.125 \div 3.125 = 9$ per cent., Ans.
3. $\$72 \times .0175 = \$1.26$; $\$8.82 \div 1.26 = 7$ per cent., Ans.
4. $\$500 \times .025 = \$12.50$; $\$550 - \$500 = \$50$; $\$50 \div 12.50 = 4$ per cent. Ans.
2. (ART. 208.) $\$140 \times .06 = \$8.40$; $\$42.00 \div 8.40 = 5$ years, Ans.
3. $\$165 \times .06 = \$9.90$; $\$14.85 \div 9.90 = 1$ year, 6 months, Ans.
4. $\$98 \times .08 = \$7.84$; $\$25.48 \div 7.84 = 3$ years, 3 months, Ans.
5. $\$727.60 - \$680 = \$47.60$; $\$680 \times .04 = \$27.20$; $\$47.60 \div 27.20 = 1$ year, 9 months, Ans.
2. (ART. 209, p. 214.) $\$1.00 \times .255 = \$0.255$; $\$24.225 \div .255 = \$95$ Ans.
3. $\$1.00 \times .28 = \$0.28$; $\$5.11 \div .28 = \$18.25$ Ans.
4. $\$1.00 \times .15 = \$0.15$; $\$42 \div .15 = \$280$ Ans.

COMPOUND INTEREST.

2. (ART. 211, p. 216.) $1.06 \times 1.06 \times 1.06 \times 1.06 \times$
 $\$761.75 = \$961.69,1; \$961.69,1 - \$761.75 =$
 $\$199.94,1 \text{ Ans.}$
- 3. $1.06 \times 1.06 \times 1.06 \times \$67.25 = \$80.09,5 \text{ Ans.}$
4. $1.07 \times 1.07 \times 1.07 \times 1.07 \times 1.07 \times \$78.69 =$
 $\$110.36,4 \text{ Ans.}$
5. $1.06 \times 1.06 \times 1.06 \times 1.028 \times \$128 = \$156.71,7 \text{ Ans.}$
6. $1.06 \times 1.06 \times 1.041\frac{1}{2} \times \$76.18 = \$89.14,7; \$89.14,7$
 $- \$76.18 = \$12.96,7 \text{ Ans.}$
2. (ART. 212, p. 217.) $\$1.315931$, amount of $\$1$ for 7
years at 4 per cent.; $\$884 \times 1.315931 = \$1163.28,3;$
 $\$1163.28,3 - \$884 = \$279.28,3 \text{ Ans.}$
3. $\$1.551328$, amount of $\$1$ for 9 years at 5 per cent.;
 $\$721 \times 1.551328 = \$1118.50,7; \$1118.50,7 - \$721$
 $= \$397.50,7 \text{ Ans.}$
4. $\$1.425760$, amount of $\$1$ for 12 years at 3 per cent.;
 $\$960 \times 1.425760 = \$1368.72,96; \$1.015$, amount
of $\$1$ for 6 months at 3 per cent.; $\$1368.72,96 \times$
 $1.015 = \$1389.26 \text{ Ans.}$
5. $\$3.869685$, amount of $\$1$ for 20 years, at 7 per cent.;
 $\$25.50 \times 3.869685 = \$98.67,696; \$1.014$, amount
of $\$1$ for 2 months and 12 days at 7 per cent.;
 $\$98.67,696 \times 1.014 = \$100.05,8 \text{ Ans.}$
6. $\$1.005$, amount of $\$1$ for 1 month; $\$1.005 \times 1.005 \times$
 $1.005 \times 1.005 \times 1.005 \times 1.005 = \$1.03037$, amount of
 $\$1$ for 6 months; $\$1.03037 \times 12 = \$12.36,444 + \text{Ans.}$
7. $\$1.000\frac{1}{2}$ amount of $\$1$ for 1 day; $\$1.000\frac{1}{2} \times 1.000\frac{1}{2} \times$
 $1.000\frac{1}{2} \times 1.000\frac{1}{2} \times 1.000\frac{1}{2} \times 1.000\frac{1}{2} = \$1.0010006 +$,
amount of $\$1$ for 6 days; $\$1.0010006 + \times 100 =$
 $\$100.10,006 + \text{Ans.}$

DISCOUNT:

2. (ART. 216, p. 219.) \$ 1.06 amount of \$ 1 for 1 year;
 $\$ 152.64 \div 1.06 = \$ 144$ Ans.
3. \$ 1.24 amount of \$ 1 for 4 years; $\$ 477.71 \div 1.24 =$
 $\$ 385.25$ Ans.
4. \$ 1.20 amount of \$ 1 for 3 years, 4 months; $\$ 172.86 \div$
 $1.20 = \$ 144.05$; $\$ 172.86 - \$ 144.05 = \$ 28.81$ Ans.
5. \$ 1.218 amount of \$ 1 for 3 years, 7 months, 18 days;
 $\$ 800 \div 1.218 = \$ 656.814 +$; $\$ 800 - \$ 656.814$
 $= \$ 143.18,6$ Ans.
6.

y.	mo.	d.
1844	0	1
1842	9	4
1	2	27

 \$ 1.0745 amount of \$ 1.00 for 1 year,
2 months, 27 days; $\$ 375.75 \div$
 $1.0745 = \$ 349.69,7$ Ans.
7.

y.	mo.	d.
1843	3	5
1843	0	1
3	4	

 \$ 1.015 $\frac{1}{2}$ amount of \$ 1.00 for 3 months,
4 days; $\$ 125.75 \div 1.015\frac{1}{2} =$
 $\$ 123.81 +$ Ans.

BANK DISCOUNT.

(ART. 218, p. 221.)

(2.)
\$ 478
<u>.010$\frac{1}{2}$</u>
4780
<u>239</u>
\$ 5.01,9

(3.)
\$ 780
<u>.005$\frac{1}{2}$</u>
3900
<u>390</u>
\$ 4.29,0

(4.)
\$ 1728
<u>.15$\frac{1}{2}$</u>
8640
<u>1728</u>
864
<u>\$ 26.78,4</u>

(5.)
\$ 1000
<u>.20$\frac{1}{2}$</u>
20000
<u>500</u>
\$ 20.50,0
\$ 1000
<u>20.50</u>
Ans. \$ 979.50

(6.)	(7.)	(8.)
\$ 875.35	\$ 596.24	\$ 1350.50
.038	.042	.080 $\frac{1}{2}$
<u>700280</u>	<u>119248</u>	<u>10804000</u>
262605	238496	67525
6)33.26,330	25.04,208	108.71,525
5.54,386	8	5
\$ 38.80,716	6)200.33,664	6)543.57,625
\$ 875.35,0	\$ 33.38,944	Ans. \$ 90.59,604
38.80,7	\$ 596.24,0	
\$ 836.54,2 Ans.	\$ 33.38,9	
	\$ 562.85,1 Ans.	

2. (ART. 219, p. 222.) \$ 1.0000 — .0205 = .9795 ; \$ 300 ÷ .9795 = \$ 306.27,8 Ans.
3. \$ 1.0000 — .0305 = .9695 ; \$ 4572.40 ÷ .9695 = \$ 4716.24,5 Ans.
4. \$ 1.0000 — .0255 = .9745 ; \$ 1000 ÷ .9745 = \$ 1026.16,7 Ans.
5. \$ 1.000000 — .50625 = .49375 ; \$ 483.56 ÷ .49375 = \$ 509.34,5 Ans.

COMMISSION AND BROKERAGE.

(ART. 221, p. 223.)

(2.)	(3.)	(4.)	(5.)
\$ 5678	\$ 7896	\$ 1728	\$ 15.50
.03	.02	.01 $\frac{1}{2}$	97
\$ 170.34	\$ 157.92	<u>1728</u>	<u>10850</u>
		864	13950
		\$ 25.92	1503.50
			.02 $\frac{1}{2}$
			30.07,00
			7.51,75
			\$ 37.58,7 $\frac{1}{2}$

(6.)	(7.)	(8.)
\$ 6 50	\$ 2.75	\$ 46256
500	88	.00 $\frac{1}{2}$
<u>3250.00</u>	<u>2200</u>	<u>\$ 57.82</u>
242.00	2200	
<u>593.60</u>	<u>\$ 242.00</u>	
4085.60		
.08 $\frac{1}{2}$		
<u>1225680</u>		
<u>306420</u>		
\$ 153.21,00		

2. (ART. 222, p. 224.) \$2000 $\div$ 1.01,5 = \$1970.44,3,
sum invested; \$2000 — \$1970.44,3 = \$29.55,7, com-
mission, Ans.
3. \$5256 $\div$ 1.03 = \$5102.91,2; \$5256 — \$5102.91,2
= \$153.08,8 Ans.
4. \$3865.94 $\div$ 1.04 = \$3717.25, sum expended; \$3865.94
— \$3717.25 = \$148.69, commission, Ans.
5. \$10000 $\div$ 1.03,25 = \$9685.23+, value of flour; \$10000
— \$9685.23+ = \$314.76+, commission, Ans.

STOCKS.

3. (ART. 224, p. 225.) \$115 $\times$ 10 = \$1150 Ans.
4. \$125 $\times$.75 = \$93.75 Ans.
5. \$8979 $\times$ 1.12 = \$10056.48 Ans.
6. \$1789 $\times$.91 = \$1627.99 Ans.
7. \$100 $\times$.12 = \$12; \$12 $\times$ 5 = \$60 Ans.
8. \$100 — \$12.50 = \$87.50; \$87.50 $\times$ 20 = \$1750 Ans.
9. \$100 + \$8.25 = \$108.25; \$108.25 $\times$ 15 = \$1623.75,
Ans.
10. \$175 $\times$.12 = \$21; \$175 — \$21 = \$154; \$154 $\times$
.87 = \$133.98; \$175 $\times$.19 $\frac{1}{2}$ = \$34.12 $\frac{1}{2}$; \$175 +
\$34.12 $\frac{1}{2}$ = \$209.12 $\frac{1}{2}$; \$209.12 $\frac{1}{2}$ $\times$ 87 = \$18193.87 $\frac{1}{2}$,
\$18193.87 $\frac{1}{2}$ — \$13398.00 = \$4795.87 $\frac{1}{2}$ Ans.

INSURANCE.

(ART. 226, p. 226.)

(2.)	(3.)	(4.)
\$ 868	\$ 1728	\$ 3500
.12	.15	.01 $\frac{1}{2}$
<u>\$ 104.16</u>	<u>8640</u>	<u>3500</u>
	1728	2625
	<u>\$ 259.20</u>	<u>\$ 61.25</u>

(5.)	(6.)
\$ 35000	\$ 75000
.03 $\frac{1}{2}$	.02 $\frac{1}{2}$
<u>105000</u>	<u>150000</u>
26250	37500
<u>\$ 1312.50</u>	<u>\$ 1875.00</u> premium.
\$ 35000.00	\$ 75000
1312.50	1875
<u>Ans. \$ 33687.50</u>	<u>\$ 73125</u> loss.

DUTIES.

(ART. 228, p. 228.)

(2.)	(3.)	(4.)
560lb.	368lb.	187
<u>4</u>	<u>4</u>	196
556	364	216
<u>44</u>	<u>44</u>	<u>150</u>
512	320	749
<u>144</u>	<u>760</u>	15 leakage.
2048	19200	734
2048	2240	<u>20</u>
512	243200	714
<u>73728</u>	.02	.25
.03	<u>\$ 4864.00</u>	3570
<u>\$ 2211.84</u>		<u>1428</u>
		<u>\$ 178.50</u>

2. (ART. 229, p. 228.) $\$3200 \times .20 = \$640$ Ans.
 3. 1 Ton = 2240lb.; 2240lb. — 9lb. = 2231lb. net; $2231 \times .04 = \$89.24$; $\$89.24 \times .30 = \$26.77,2$, duty, Ans.
 4. 1698lb. — 7lb. = 1691lb. net weight; $1691 \times .05 = \$84.55$; $\$84.55 \times .20 = \$16.91$, duty, Ans.
 5. $150 \times 10 = 1500$; $1500 - 30 = 1470$; $1470 - 50 = 1420$; $1420 \times .25 = \$355$; $\$355 \times .20 = \$71$, duty, Ans.
 6. 450lb. — 4lb. = 446lb.; $446 \times .15 = 67$; $446 - 67 = 379$ lb.; $379 \times 13 = 4927$ lb. net weight; $4927 \times .08 = \$394.16$; $\$394.16 \times .30 = \$118.24$ Ans. [Ans.
 7. $1376 \times \$4.84 = \$6659.84$; $\$6659.84 \times .33 = \$2197.74,7$,

ASSESSMENT OF TAXES.

(ART. 231, p. 230.)

(2.)

- $\$1.25 \times 600 = \$750$, amount assessed on the polls.
 $\$3600 - \$750 = \$2850$, am't to be assessed on the property.
 $\$560,000 + \$152,500 = \$712,500$, am't of taxable property.
 $\$2850 \div 712,500 = .004$, tax on \$ 1.00.
 $\$4100 \times .004 = \$16.40$, B.'s tax on real estate.
 $\$1800 \times .004 = \$7.20$, B.'s tax on personal property.
 $\$1.25 \times 4 = \$5.00$, B.'s tax on 4 polls.
 $\$16.40 + \$7.20 + \$5.00 = \$28.60$, B.'s tax.

(3.)

- $\$15,800 \times .004 = \$63.20$, tax on C.'s property.
 $\$1.25 \times 1 = \$1.25$, C.'s tax on 1 poll.
 $\$63.20 + \$1.25 = \$64.45$, C.'s tax, Ans.

(4.)

- $\$40,000 \times .004 = \$160$, tax on D.'s real estate.
 $\$23,600 \times .004 = \$94.40$, tax on D.'s personal property.
 $\$1.25 \times 3 = \$3.75$, D.'s tax for 3 polls.
 $\$160 + \$94.40 + \$3.75 = \$258.15$, am't of D.'s tax, Ans.

(ART. 232, p. 231.)

(1.)

 $\$1.50 \times 500 = \$750.00$, amount assessed on the polls. $\$3900 - \$750 = \$3150$, am't to be assessed on the property. $\$840,000 \div \$3150 = \$1,050,000$, am't of taxable property. $\$3150 \div 1,050,000 = \$.003$, assessment on \$ 1.00.

(3.)

 $\$3175$ Tax on \$9000 = \$27.00 $\$6535$ " 700 = 2.10 $\$9710$ " 10 = .03 $\$9710$ " 6 polls = 9.00

Ans. \$38.13

(4.)

Tax on \$7600 = \$21.00

" 400 = 1.20

" 80 = .24

" 1 poll = 1.50

Ans. \$23.94

(5.)

Tax on \$4000 = \$12.00

" 700 = 2.10

" 90 = .27

" 2 polls = 3.00

Ans. \$17.37

(6.)

Tax on \$12000 = \$36.00

" 800 = 2.40

" 80 = .24

" 4 polls = 6.00

\$12880

Ans. \$44.64

EQUATION OF PAYMENTS.

(ART. 234, p. 233.)

(2.)

 $\$250 \times 4 = 1000$ $\$350 \times 8 = 2800$ $\$400 \times 12 = 4800$ $\$1000$ 1000) 6000 (8mo.

8000

600

30

1000) 18000 (18da.

18000

Ans. 8mo. 18da.

(3.)

 $\$390 \times 3 = 1170$ $\$312 \times 6 = 1872$ $\$260 \times 8 = 2080$ $\$598 \times 10 = 5980$ $\$1560$ 1560) 11102 (7 $\frac{3}{4}$ mo.

10920

182

1560 = 7 $\frac{3}{4}$

KEY TO

(4.)	(5.)
\$ 1000	\$ 1250
\$ 1000 $\times$ 12 = 12000	\$ 1250 $\times$ 6 = 7500
\$ 2000 $\times$ 24 = <u>48000</u>	\$ 1000 $\times$ 9 = 9000
\$ 4000 4000)60000(15mo.	\$ 1500 $\times$ 12 = <u>18000</u>
	\$ 5000 5000)34500(6mo
	<u>30000</u>
	4500
	<u>30</u>
	5000)135000(27da.
	<u>10000</u>
(ART. 235, p. 235.)	35000
	<u>35000</u>

(2.)

Due April 15, \$ 96.46	
" 24, 49.63 $\times$ 9 = 44667	
May 1, 175.80 $\times$ 16 = 281280	
" 11, 78.39 $\times$ 26 = 203814	
Sept. 19, <u>114.92</u> $\times$ 157 = <u>1804244</u>	
\$ 515.20 51520)2334005(45+da.	
	<u>206080</u>
	273205
	<u>257600</u>
Ans. May 31st, or in 46da.	15605

(3.)

Due May 7, 1841, \$ 375.60	
Aug. 18, " 687.25 $\times$ 103 = 7078675	
Dec. 7, " 568.50 $\times$ 214 = 12165900	
March 1, 1842, 100.00 $\times$ 298 = 2980000	
" 25, " 300.00 $\times$ 322 = 9660000	
Aug. 5, " <u>675.75</u> $\times$ 455 = <u>30746625</u>	
\$ 2707.10 270710)62631200(231+da.	
	<u>541420</u>
	848920
	<u>812130</u>
	367900
	<u>270710</u>
Ans. Dec. 25, or in 232da.	97190

(4.)

Due April 1, 1847,	\$ 436.50	
" 11, "	129.50 × 10 =	129500
July 15, "	132.00 × 105 =	1386000
Sept. 1, "	405.00 × 153 =	6196500
" 5, "	72.00 × 157 =	1130400
Oct. 25, "	91.00 × 207 =	1883700
Feb. 29, 1848,	120.00 × 334 =	4008000
	\$ 1386.00	138600
		14734100(106+da.
		138600
		874150
		831600
Ans. July 17, or in 107da.		42550

(5.)

Due July 1, 1844,	\$ 300	
Nov. 1, "	500 × 4 =	2000
March 1, 1845,	200 × 8 =	1600
Oct. 1, "	800 × 15 =	12000
April 1, 1847,	400 × 33 =	13200
July 1, "	900 × 36 =	32400
Aug. 1, "	100 × 37 =	3700
	\$ 3200	3200
		64900(20mo. 9da.
		6400
		900
		30
		3200
		27000(8+da.
		25600
Ans. March 10, 1846.		1400

PROPORTION.

SIMPLE PROPORTION.

5. (ART. 248, p. 241.) 63gal. : 9gal. :: \$ 14.49 : \$ 2.07 Ans.
 6. 19A. : 97A. :: \$ 337.25 : \$ 1721.75 Ans.
 7. 11da. : 47da. :: 319 miles : 1363 miles, Ans.
 8. 4lb. : 48lb. :: 7lb. : 84lb. Ans.

9. \$ 5437.50 : \$ 7687.50 :: 87 tons : 123 tons, Ans.
10. 15bar. : 79bar. :: \$ 120 : \$ 632 Ans.
11. 3 days : 12 days :: 9 horses : 36 horses, Ans.
12. 7gal. : 27gal. :: \$ 5.88 : \$ 22.68 Ans.
13. 9lb. : 147lb. :: \$ 10.80 : \$ 176.40 Ans.
14. 9 tons : 27 tons :: \$ 85.95 : \$ 257.85 Ans.
15. 15 tons : 765 tons :: \$ 105 : \$ 5355 Ans.
16. 16hhd. : 176hhd. :: \$ 320 : \$ 3520 Ans.
17. 15cwt. 3qr. 17lb. = 1781lb. : 76cwt. 2qr. 19lb. = 8587lb.
:: \$ 124.67 : \$ 601.09 Ans.
18. 7s. 6d. = 90d. : 76s. 19s. 11d. = 18479d. :: \$ 1 :
\$ 205.32 $\frac{2}{3}$ Ans.
19. 8s. = 96d. : 19s. 8d. = 4796d. :: \$ 1 : \$ 49.95 $\frac{1}{4}$ Ans.
20. 4s. 8d. = 56d. : 176s. 4d. = 42460d. :: \$ 1 :
\$ 758.21 $\frac{1}{4}$ Ans.
21. 4s. 6d. = 54d. : 769s. 18s. 9d. = 184785d. :: \$ 1 :
\$ 3421.94 $\frac{1}{4}$ Ans.
22. 1m. : 32m. :: 2m. 8sec. = 128sec. : 4096sec. = 1h. 8m.
16sec. Ans.
23. 1A. = 160p. : 144A. 3R. 17p. = 23177p. :: \$ 37.86 :
\$ 5484.25 $\frac{1}{4}$ Ans.
24. 1h. = 3600sec. : 9h. 45m. 19sec. = 35119sec. :: 3m. 7fur.
18rd. = 1258rd. : 12272 $\frac{1}{4}$ rd. = 38m. 2fur. 32 $\frac{1}{4}$ rd. Ans.
25. 21 — 15 = 6rd. : 21rd. :: 96rd. : 336rd. Ans.
26. 4 + 5 = 9 men : 5 men :: 12h. : 6 $\frac{2}{3}$ h. Ans.
27. 10 — 3 = 7 men : 10 men :: 63da. : 90da. Ans.
28. \$ 7.50 : \$ 5.00 :: 5oz. : 3 $\frac{1}{2}$ oz. Ans.
29. 13h. : 14h. :: 10da. : 10 $\frac{1}{14}$ da. Ans.
30. 40lb. : 79lb. :: 29lb. : 57 $\frac{1}{4}$ lb. Ans.
34. 11 $\frac{1}{4}$ yd. : 100yd. :: 4 $\frac{1}{4}$ yd. = $\frac{5}{2}$: $\frac{100}{5} = 20$:: $\frac{11}{4} = \frac{5}{2} \times \frac{100}{5}$
• $\times \frac{11}{4} = \frac{2}{5} \times \frac{5}{2} \times \frac{100}{5} = 39\frac{1}{4}$ yd. Ans.
35. 5 $\frac{1}{4}$ cwt. : 25 $\frac{1}{4}$ cwt. :: 14 $\frac{1}{2}$ E. E. = $\frac{11}{2}$: $\frac{25}{11} = \frac{11}{2}$ E. E.
= $\frac{11}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{5}{2}$ qr. = $\frac{11}{61} \times \frac{282}{11} \times \frac{595}{32} = 16\frac{1}{2}$
= 85yd. 3qr. 3 $\frac{1}{2}$ na. Ans.

36. 18da. : 36da. :: 144 men : 108 men; $144 - 108 = 36$ men, Ans.

37. $\overset{d}{6} : \overset{d}{1} :: \overset{w}{1} : \overset{w}{\frac{1}{6}}$, the part James will do in one day.

$8 : 1 :: 1 : \frac{1}{8}$, the part John will do in one day.

$\frac{1}{6} + \frac{1}{8} = \frac{7}{24}$, the part James and John will do in one day.

$\frac{7}{24}w. : 1w. :: 1da. : 3\frac{3}{4}da.$ Ans.

38. 9h. : 1h. :: 1w. : $\frac{1}{9}w.$ = part Samuel will do in one day.

4h. : 1h. :: 1w. : $\frac{1}{4}w.$ = part Samuel and Alfred will do in one day.

$\frac{1}{4} - \frac{1}{9} = \frac{5}{36}$ = part Alfred will do in one day.

$\frac{5}{36}w. : 1w. :: 1h. : 7\frac{1}{4}h.$ Ans.

39. 10da. : 1da. :: 1w. : $\frac{1}{10}w.$ = part Atwood would do in a day.

7da. : 1da. :: 1w. : $\frac{1}{7}w.$ = part Jerry and his father would do in a day.

6da. : 1da. :: 1w. : $\frac{1}{6}w.$ = part Jacob and his father would do in a day.

$\frac{1}{7} - \frac{1}{10} = \frac{3}{70}$ = part Jerry would do in a day.

$\frac{1}{6} - \frac{1}{10} = \frac{1}{15}$ = part Jacob would do in a day.

$\frac{3}{70} + \frac{1}{15} = \frac{23}{210}$ = part Jerry and Jacob would do in a day.

$\frac{23}{210}w. : 1w. :: 1da. : 9\frac{2}{3}$ days, Ans.

41. $\$5.00 \times 40 = \$200.00$, price given for the cloth;

$\$1.00 : \$1.15 :: \$200.00 : \$230.00$ Ans.

42. $\$1.00 : \$0.70 :: \$175.00 : \$122.50$ Ans.

43. $\$6.00 - \$5.00 = \$1.00$;

$\$5.00 : \$1.00 :: \$100 : 20$ per cent., Ans.

44. $\$15.00 - \$12.00 = \$3.00$;

$\$15.00 : \$3.00 :: \$100 : 20$ per cent., Ans.

45. $\frac{133}{100} - \frac{30}{100} = \frac{103}{100} : \frac{30}{100} :: \$60 : \$120$ Ans.

46. $\$0.25 : \$27.50 :: 1gal. : 110$ gallons, Ans.

47. $\$15.75 : \$1728 :: 1A. : 109A. 2R. 34\frac{1}{2}p.$ Ans.

48. If the first cock will empty the cistern in 2 hours, in 1 hour $\frac{1}{2}$ of it will be emptied. The second cock will empty $\frac{1}{3}$ of it in 1 hour. The third cock will empty $\frac{1}{4}$ of it in 1 hour. Therefore, in 1 hour, $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{13}{12}$ of the

cistern will be emptied. And if $\frac{1}{3}$ of the cistern be emptied in 1 hour, $\frac{1}{3}$, or the whole cistern, will be emptied in $55\frac{1}{3}$ minutes; $\frac{1}{3} : \frac{1}{3} :: 60m. : 55\frac{1}{3}m.$ Ans.

COMPOUND PROPORTION.

(ART. 250, p. 246.)

$$\begin{array}{l} \text{\$ 800 : \text{\$ 100} } \\ \text{\$ 6 : \text{\$ 32} } \end{array} \left. \vphantom{\begin{array}{l} \text{\$ 800 : \text{\$ 100} } \\ \text{\$ 6 : \text{\$ 32} } \end{array}} \right\} :: 12mo. : 8mo. \text{ Ans. } \frac{100 \times 32 \times 12}{800 \times 6} = 8mo.$$

$$\begin{array}{l} \text{\$ 6 : \text{\$ 32} } \\ 8mo. : 12mo. \end{array} \left. \vphantom{\begin{array}{l} \text{\$ 6 : \text{\$ 32} } \\ 8mo. : 12mo. \end{array}} \right\} :: \text{\$ 100 : \text{\$ 800} \text{ Ans. } } \frac{32 \times 12 \times 100}{6 \times 8} = \text{\$ 800}$$

$$\begin{array}{l} \text{\$ 800 : \text{\$ 100} } \\ 8mo. : 12mo. \end{array} \left. \vphantom{\begin{array}{l} \text{\$ 800 : \text{\$ 100} } \\ 8mo. : 12mo. \end{array}} \right\} :: \text{\$ 32 : \text{\$ 6}, \text{ that is, 6 per cent., Ans. }$$

$$\frac{100 \times 12 \times 32}{800 \times 8} = \text{\$ 6.}$$

$$\begin{array}{l} 20 \text{ men : 15 men } \\ 10 \text{ hours : 15 hours } \end{array} \left. \vphantom{\begin{array}{l} 20 \text{ men : 15 men } \\ 10 \text{ hours : 15 hours } \end{array}} \right\} :: 60 \text{ days : } 67\frac{1}{2} \text{ days, Ans.}$$

$$\frac{15 \times 15 \times 60}{20 \times 10} = 13\frac{1}{2} = 67\frac{1}{2} \text{ days.}$$

$$\begin{array}{l} 351bu. : 1404bu. \\ 2w. : 3w. \end{array} \left. \vphantom{\begin{array}{l} 351bu. : 1404bu. \\ 2w. : 3w. \end{array}} \right\} :: 939 \text{ men : } 5634 \text{ men, Ans.}$$

$$\frac{1404 \times 3 \times 939}{351 \times 2} = 5634 \text{ men.}$$

(8.)

8 men : 12 men } :: \$ 64 : \$ 384 Ans.
13 weeks : 52 weeks }

$$\frac{12 \times \overset{4}{52} \times \overset{8}{64}}{8 \times 13} = \$ 384$$

(9.)

8 horses : 32 horses } :: 42 bushels : 336 bushels, Ans.
24 days : 48 days }

$$\frac{\overset{4}{32} \times \overset{2}{48} \times 42}{8 \times 24} = 336 \text{ bushels.}$$

(10.)

24 men : 6 men }
16 hours : 9 hours } :: 16 days : 90 days, Ans.
20 feet : 200 feet }
6 feet : 16 feet }
4 feet : 6 feet }

$$\frac{6 \times 9 \times \overset{10}{200} \times \overset{4}{16} \times 6 \times \overset{4}{16}}{\overset{4}{24} \times 16 \times 20 \times 6 \times 4} = 90 \text{ days.}$$

(11.)

15 days : 20 days } :: 117 miles : 208 miles, Ans.
9 hours : 12 hours }

$$\frac{\overset{4}{20} \times \overset{4}{12} \times \overset{13}{117}}{\overset{3}{15} \times 9} = 208 \text{ miles.}$$

(12.)

30 men : 12 men }
30 feet : 300 feet } :: 15 days : 240 days, Ans.
6 feet : 8 feet }
3 feet : 6 feet }
8 hours : 12 hours }

$$\frac{\overset{4}{12} \times \overset{10}{300} \times 8 \times \overset{4}{6} \times \overset{4}{12} \times 15}{\overset{3}{30} \times \overset{3}{30} \times 6 \times 3 \times 8} = 240 \text{ days.}$$

$$\begin{array}{l} 644\text{lb.} : 865\text{lb.} \\ 150\text{ miles} : 32\text{ miles} \end{array} \left. \vphantom{\begin{array}{l} 644\text{lb.} : 865\text{lb.} \\ 150\text{ miles} : 32\text{ miles} \end{array}} \right\} (13.) : : \$24.58 : \$7.04 + \text{Ans.}$$

$$\frac{173 \quad 4}{644 \times 32 \times 24.58} = \frac{173 \times 4}{24112} = \$7.04 +.$$

$$\frac{161 \quad 75}{15}$$

$$\begin{array}{l} \$1800 : \$600 \\ \$9 : \$9 \end{array} \left. \vphantom{\begin{array}{l} \$1800 : \$600 \\ \$9 : \$9 \end{array}} \right\} (14.) : : 6\text{ months} : 2\text{ months, Ans.}$$

$$\frac{600 \times 9 \times 6}{1800 \times 9} = 2\text{ months.}$$

$$\frac{2}{3}$$

$$\begin{array}{l} 20\text{ cows} : 28\text{ cows} \\ 8\text{ weeks} : 12\text{ weeks} \end{array} \left. \vphantom{\begin{array}{l} 20\text{ cows} : 28\text{ cows} \\ 8\text{ weeks} : 12\text{ weeks} \end{array}} \right\} (15.) : : 3\text{ tons} : 6\frac{3}{10}\text{ tons, Ans.}$$

$$\frac{7 \quad 3}{28 \times 12 \times 3} = \frac{21}{1008} = 6\frac{3}{10}\text{ tons.}$$

$$\frac{20 \times 8}{5 \quad 2}$$

$$\begin{array}{l} 12\frac{1}{11}\text{ men} : 5\text{ men} \\ 30\text{ acres} : 54\text{ acres} \end{array} \left. \vphantom{\begin{array}{l} 12\frac{1}{11}\text{ men} : 5\text{ men} \\ 30\text{ acres} : 54\text{ acres} \end{array}} \right\} (16.) : : 10\text{ days} : 7\frac{21}{137}\text{ days, Ans.}$$

$$\frac{18}{5 \times 54 \times 10} = \frac{90}{137 \times 30} = \frac{30}{137} \times \frac{11}{137} = \frac{330}{137} = 7\frac{21}{137}\text{ days.}$$

$$\frac{137 \times 30}{3}$$

$$\begin{array}{l} 18\text{ men} : 2\text{ men} \\ 12\frac{3}{4}\text{ rods} : 247\frac{3}{4}\text{ rods} \end{array} \left. \vphantom{\begin{array}{l} 18\text{ men} : 2\text{ men} \\ 12\frac{3}{4}\text{ rods} : 247\frac{3}{4}\text{ rods} \end{array}} \right\} (17.) : : 6\frac{1}{2}\text{ days} : 14\text{ days, Ans.}$$

$$\frac{2 \times \frac{3213}{13} \times \frac{13}{2}}{13 \times \frac{51}{2}} = 14\text{ days.}$$

$$\frac{3213}{2} \times \frac{51}{2}$$

(18.)

24 men :	248 men	} :: 5½ days : 132 days, Ans.
9 hours :	11 hours	
7 hard. :	4 hard.	
232½ feet :	337½ feet	
3½ feet :	5½ feet	
2½ feet :	3½ feet	

$$\frac{\begin{array}{ccccccc} & & 3 & & & & \\ & & 55 & & & & \\ & & 135 & & 4 & & \\ 81 & & 675 & & 25 & & 11 \\ 243 \times 11 \times 4 \times & \times & \frac{2}{2} \times \frac{25}{5} \times \frac{7}{2} \times \frac{11}{2} & & & & \\ \hline & & 24 \times 9 \times 7 \times & \times & \frac{45}{2} \times \frac{11}{3} \times \frac{7}{3} & & \\ & 4 & 3 & & & & \end{array}}{= 132 \text{ days.}}$$

PARTNERSHIP, OR COMPANY BUSINESS.

(Арт. 252, р. 249.)

(2.)

A's stock, \$ 6000 $\frac{6000}{20000} = \frac{3}{10}$, A's fractional part.

B's stock, \$ 9000 $\frac{9000}{20000} = \frac{9}{20}$, B's fractional part.

C's stock, \$ 5000 $\frac{5000}{20000} = \frac{1}{4}$, C's fractional part.

$\begin{array}{r} \$840 \\ 3 \overline{) 2520} \\ \$252, \text{ A's gain.} \end{array}$	$\begin{array}{r} \$20000 \\ 9 \overline{) 7560} \\ \$378, \text{ B's gain.} \end{array}$	$\begin{array}{r} \$840 \\ 1 \overline{) 840} \\ \$210, \text{ C's gain.} \end{array}$
---	---	--

(3.)

Parker, \$ 8750 $\frac{8750}{19360} = \frac{875}{1936}$, Parker's part.

Dole, \$ 3610 $\frac{3610}{19360} = \frac{361}{1936}$, Dole's part.

$$\text{Gage, } \$7000 \quad \frac{7000}{18360} = \frac{700}{1836}, \text{ Gage's part.}$$

$\$19360$ $\$6875 - \$375 = \$6500$
 $\frac{\$6500 \times 875}{1936} = \$2937.75_{121} = \text{Parker's dividend.}$
 $\frac{\$6500 \times 361}{1936} = \$1212.03_{121} = \text{Dole's dividend.}$
 $\frac{\$6500 \times 700}{1936} = \$2350.20_{121} = \text{Gage's dividend.}$

(4.)

A's debt \$ 500 $\frac{500}{2000} = \frac{1}{4}$, A's fractional part.B's debt \$ 386 $\frac{386}{2000} = \frac{193}{1000}$, B's fractional part.C's debt \$ 988 $\frac{988}{2000} = \frac{247}{500}$, C's fractional part.D's debt \$ 126 $\frac{126}{2000} = \frac{63}{1000}$, D's fractional part.

\$ 2000

$$\frac{\$ 100 \times 1}{4} = \$ 25.00, \text{ A's part.} \quad \frac{\$ 100 \times 247}{500} = \$ 49.40, \text{ C's part.}$$

$$\frac{\$ 100 \times 193}{1000} = \$ 19.30, \text{ B's part.} \quad \frac{\$ 100 \times 63}{1000} = \$ 6.30, \text{ D's part.}$$

(5.)

The whole gain is \$ 90; but C's gain is \$ 30; A and B's gain, therefore, is \$ 90 — \$ 30 = \$ 60; A's stock being \$ 700, his share of the gain will be $\frac{700}{1000} = \frac{7}{10}$ of \$ 60 = \$ 42. B's stock being \$ 300, his share of the gain will be $\frac{300}{1000} = \frac{3}{10}$ of \$ 60 = \$ 18. As the stock of each person in the firm bears the same proportion to his gain as the other, and as A's gain is \$ 42, and his stock \$ 700, therefore, \$ 42 A's gain : \$ 700 A's stock :: \$ 30 C's gain : \$ 500 C's stock. Then \$ 500 ÷ 100 = \$ 5.00, value of C's flour per barrel.

STATEMENT.

$$\begin{aligned} \$ 1000 : \$ 60 :: \$ 700 : \$ 42, \text{ A's gain,} \\ \$ 1000 : \$ 60 :: \$ 300 : \$ 18, \text{ B's gain,} \end{aligned} \quad \left. \vphantom{\begin{aligned} \$ 1000 : \$ 60 :: \$ 700 : \$ 42, \\ \$ 1000 : \$ 60 :: \$ 300 : \$ 18, \end{aligned}} \right\} \text{Ans.}$$

$$\$ 42 : \$ 700 :: \$ 30 : \$ 500, \text{ C's stock.}$$

$$\$ 500 \div 100 = \$ 5.00, \text{ value of C's flour per barrel, Ans.}$$

(ART. 253, p. 250.)

(2.)

$$\$ 700 \times 5 = 3500 \quad \frac{3500}{13300} = \frac{5}{133}, \text{ A's fraction.}$$

$$\$ 800 \times 6 = 4800 \quad \frac{4800}{13300} = \frac{48}{133}, \text{ B's fraction.}$$

$$\$ 500 \times 10 = 5000 \quad \frac{5000}{13300} = \frac{50}{133}, \text{ C's fraction.}$$

\$ 13300

$$\frac{\$ 399 \times 35}{133} = \$ 105, \text{ A's gain.} \quad \frac{\$ 399 \times 48}{133} = \$ 144, \text{ B's gain.}$$

$$\frac{\$ 399 \times 50}{133} = \$ 150, \text{ C's gain.}$$

(3.)

$$\text{Johnson's stock, } \$1000 \times 6 = 6000$$

$$\begin{array}{r} 500 \\ \hline \end{array}$$

$$\frac{11111}{1111} = \frac{111}{1}, \text{ Johnson.}$$

$$\$1500 \times 6 = 9000$$

$$\begin{array}{r} \$15000 \\ \hline \end{array}$$

$$\text{Hyde's stock, } \$800 \times 4 = 3200$$

$$\begin{array}{r} 400 \\ \hline \end{array}$$

$$\$1200 \times 6 = 7200$$

$$\begin{array}{r} 500 \\ \hline \end{array}$$

$$\frac{11111}{1111} = \frac{111}{1}, \text{ Hyde.}$$

$$\$700 \times 2 = 1400$$

$$\begin{array}{r} \$11800 \\ \hline \end{array}$$

$$\text{Tyler's stock, } \$1200 \times 7 = 8400$$

$$\begin{array}{r} 300 \\ \hline \end{array}$$

$$\frac{11111}{1111} = \frac{111}{1}, \text{ Tyler.}$$

$$\$1500 \times 3 = 4500$$

$$\begin{array}{r} 200 \\ \hline \end{array}$$

$$\begin{array}{r} \$15000 \\ 11800 \\ \hline 16300 \end{array}$$

$$\$1700 \times 2 = 3400$$

$$\begin{array}{r} \$16300 \\ \hline \end{array}$$

$$\begin{array}{r} \$43100 \end{array}$$

$$\frac{\$1000 \times 150}{431} = \$348.02 \frac{111}{111}, \text{ Johnson's gain.}$$

$$\frac{\$1000 \times 118}{431} = \$273.78 \frac{111}{111}, \text{ Hyde's gain.}$$

$$\frac{\$1000 \times 163}{431} = \$378.19 \frac{111}{111}, \text{ Tyler's gain.}$$

(4.)

The stock in trade is a horse and chaise to ride to Newburyport and back; the whole distance being 30 miles. The expense for the horse and chaise may be considered the "loss"; and the proportional part which each rode, the "time." Now, by the rule, each man is to bear his share of the loss (expense) in proportion as he has the use of the stock in trade (horse and chaise). Morse had the use of the whole stock in trade for the first 4 and last 4 miles, for which he must pay $\frac{8}{30} = \frac{4}{15}$ of $\$3.00 = \$0.80$. For the remaining part of the distance, 22 miles, the expense was $\frac{22}{30} = \frac{11}{15}$ of $\$3.00 =$

\$2.20. Of this sum, Jones and Morse will pay equal parts =
 $\$2.20 \div 2 = \$1.10$. Morse will therefore pay $\$0.80 +$
 $\$1.10 = \$1.90$, and Jones $\$1.10$.

$$\frac{1}{15} + \frac{11}{15} \times \frac{1}{2} = \frac{13}{30}, \text{ Morse's product.}$$

$$\frac{11}{15} \times \frac{1}{2} = \frac{11}{30}, \text{ Jones's product.}$$

$\frac{24}{30}$, sum of the products.

$$\frac{13}{30} : \frac{11}{30} :: \$3.00$$

19

2700

300

30)5700 (\$1.90 = Morse's share of the expense.

30

270

270

0

$$\frac{13}{30} : \frac{11}{30} :: \$3.00$$

11

30)3300 (\$1.10 = Jones's share of the expense.

30

30

30

0

(5.)

As Jones's capital was invested 12 months and Cotton's but 9 months, Cotton's capital must be $\frac{1}{2}$ of Jones's capital.

9 months : 12 months :: \$1000 : \$1333.33 $\frac{1}{3}$ Ans.

(6.)

\$96 $\div$ 8 = \$12, S's gain in 1 mo. $\frac{1}{3}$ = S's share of stock.

\$90 $\div$ 6 = \$15, C's gain in 1 mo. $\frac{1}{3}$ = C's share.

\$80 $\div$ 4 = \$20, D's gain in 1 mo. $\frac{2}{3}$ = D's share.

\$47 whole gain.

$\$4700 \times \frac{1}{3} = \$1566\frac{2}{3}$, S's stock, }
 $\$4700 \times \frac{1}{3} = \$1566\frac{2}{3}$, C's stock, } Ans.
 $\$4700 \times \frac{2}{3} = \$3133\frac{1}{3}$, D's stock, }

(7.)

$$\begin{aligned} \$4000 \times 5 &= \$20000 & \frac{20000}{68000} &= \frac{1}{17}, \text{ P's share of the gain.} \\ \$6000 \times 8 &= \$48000 & \frac{48000}{68000} &= \frac{12}{17}, \text{ H's share.} \\ && \$68000 & \end{aligned}$$

$$\begin{aligned} \$680 \times \frac{1}{17} &= \$200, \text{ P's gain,} \\ \$680 \times \frac{12}{17} &= \$480, \text{ H's gain,} \end{aligned} \quad \left. \vphantom{\begin{aligned} \$680 \times \frac{1}{17} &= \$200, \text{ P's gain,} \\ \$680 \times \frac{12}{17} &= \$480, \text{ H's gain,} \end{aligned}} \right\} \text{Ans.}$$

(8.)

$$\begin{aligned} \$300 \times 7 &= \$2100 & \frac{2100}{8500} &= \frac{21}{85}, \text{ A's part.} \\ \$500 \times 8 &= \$4000 & \frac{4000}{8500} &= \frac{8}{17}, \text{ B's part.} \\ \$200 \times 12 &= \$2400 & \frac{2400}{8500} &= \frac{24}{85}, \text{ C's part.} \\ && \$8500 & \end{aligned}$$

$$\begin{aligned} \$85 \times \frac{21}{85} &= \$21, \text{ A's gain,} \\ \$85 \times \frac{8}{17} &= \$40, \text{ B's gain,} \\ \$85 \times \frac{24}{85} &= \$24, \text{ C's gain,} \end{aligned} \quad \left. \vphantom{\begin{aligned} \$85 \times \frac{21}{85} &= \$21, \text{ A's gain,} \\ \$85 \times \frac{8}{17} &= \$40, \text{ B's gain,} \\ \$85 \times \frac{24}{85} &= \$24, \text{ C's gain,} \end{aligned}} \right\} \text{Ans.}$$

(9.)

$$\begin{aligned} \$10 \div 5 &= \$2, \text{ A's gain in 1 mo.} & \frac{2}{5} &= \text{A's part of stock.} \\ \$12 \div 4 &= \$3, \text{ B's gain in 1 mo.} & \frac{3}{5} &= \text{B's part.} \\ && \$5 & \end{aligned}$$

$$\begin{aligned} \$500 \times \frac{2}{5} &= \$200, \text{ A's stock,} \\ \$500 \times \frac{3}{5} &= \$300, \text{ B's stock,} \end{aligned} \quad \left. \vphantom{\begin{aligned} \$500 \times \frac{2}{5} &= \$200, \text{ A's stock,} \\ \$500 \times \frac{3}{5} &= \$300, \text{ B's stock,} \end{aligned}} \right\} \text{Ans.}$$

(10.)

$$\begin{aligned} \$3000 \times 6 &= \$18000 & \$6000 \times 8 &= \$48000 \\ \$2000 & & \$3000 & \\ \$5000 \times 6 &= \$30000 & \$3000 \times 4 &= \$12000 \\ && \$48000, \text{ A.} & \quad \$60000, \text{ B.} \end{aligned}$$

$$\begin{aligned} \$48000 & & \frac{48000}{108000} &= \frac{4}{9}, \text{ A's share.} \\ \$60000 & & \frac{60000}{108000} &= \frac{5}{9}, \text{ B's share.} \\ \$108000 & & & \end{aligned}$$

$$\begin{aligned} \$1080 \times \frac{4}{9} &= \$480, \text{ A's gain,} \\ \$1080 \times \frac{5}{9} &= \$600, \text{ B's gain,} \end{aligned} \quad \left. \vphantom{\begin{aligned} \$1080 \times \frac{4}{9} &= \$480, \text{ A's gain,} \\ \$1080 \times \frac{5}{9} &= \$600, \text{ B's gain,} \end{aligned}} \right\} \text{Ans.}$$

(11.)

$$\begin{array}{rcl}
 5 \times 4 = 20 & \frac{20}{150} = \frac{2}{15}, A. \\
 6 \times 8 = 48 & \frac{48}{150} = \frac{8}{25}, B. \\
 8 \times 5 = 40 & \frac{40}{150} = \frac{4}{15}, C. \\
 3 \times 14 = 42 & \frac{42}{150} = \frac{7}{25}, D. \\
 \hline
 & 150
 \end{array}$$

$$\begin{array}{l}
 \$ 50 \times \frac{2}{15} = \$ 6.66\frac{2}{3}, A's \text{ share}, \\
 \$ 50 \times \frac{8}{25} = \$ 16.00, B's \text{ share}, \\
 \$ 50 \times \frac{4}{15} = \$ 13.33\frac{1}{3}, C's \text{ share}, \\
 \$ 50 \times \frac{7}{25} = \$ 14.00, D's \text{ share},
 \end{array} \left. \vphantom{\begin{array}{l} \\ \\ \\ \end{array}} \right\} \text{Ans.}$$

(12.)

$$\begin{array}{rcl}
 30 \times 50 = 1500 & \frac{1500}{5910} = \frac{50}{197}, A. \\
 50 \times 36 = 1800 & \frac{1800}{5910} = \frac{60}{197}, B. \\
 58 \times 45 = 2610 & \frac{2610}{5910} = \frac{87}{197}, C. \\
 \hline
 & 5910
 \end{array}$$

$$\$ 7500 - \$ 112.50 = \$ 7387.50.$$

$$\begin{array}{l}
 \$ 7387.50 \times \frac{50}{197} = \$ 1875, A \text{ receives}, \\
 \$ 7387.50 \times \frac{60}{197} = \$ 2250, B \text{ receives}, \\
 \$ 7387.50 \times \frac{87}{197} = \$ 3262.50 + \$ 112.50 = \$ 3375, C
 \end{array} \left. \vphantom{\begin{array}{l} \\ \\ \end{array}} \right\} \begin{array}{l} \text{[receives,} \\ \text{Ans.} \end{array}$$

PROFIT AND LOSS.

3. (ART. 255, p. 253.) $\$ 5.40 \times 40 = \$ 216$, price paid;
 $40 \times \frac{1}{4} = 30$; $\$ 6.00 \times 30 = \$ 180$; $40 \times \frac{1}{4} = 10$;
 $\$ 7 \times 10 = \$ 70$; $\$ 180 + \$ 70 = \$ 250$, price sold at;
 $\$ 216 : \$ 250 :: \$ 100 : \$ 115\frac{2}{3}$; $\$ 115\frac{2}{3} - \$ 100$
 $= \$ 15\frac{2}{3} = 15\frac{2}{3}$ per cent., Ans.
4. $\$ 5 \times 50 = \$ 250$, price paid; $\$ 5.98 \div 1.04 = \$ 5.75$,
present worth of $\$ 5.98$ due 8 months hence; $\$ 5.75 \times$
 $50 = \$ 287.50$, price sold at; $\$ 250 : \$ 287.50 :: \$ 100$
 $: \$ 115$; $\$ 115 - \$ 100 = \$ 15 = 15$ per cent., Ans.
5. $100 \times \$ 0.30 = \$ 30$, price paid; $100 - 30 = 70$; $70 \times$
 $\$ 0.40 = \$ 28$, price sold at; $\$ 30 : \$ 28 :: \$ 100 :$
 $\$ 93\frac{1}{3}$; $\$ 100 - \$ 93\frac{1}{3} = \$ 6\frac{2}{3} = 6\frac{2}{3}$ per cent., Ans.

6. $3000 \times \$1.12\frac{1}{2} = \$3375$, price paid; $3000 \times \$0.05 = \$150$, cost of transportation; $\$3375 + \$150 = \$3525$, whole cost; $3000 \times \$1.37\frac{1}{2} = \$4125$, price sold at; $\$3525 : \$4125 :: \$100 : \$117\frac{1}{4}$; $\$117\frac{1}{4} - \$100 = \$17\frac{1}{4} = 17\frac{1}{4}$ per cent., Ans.
7. $7\frac{3}{4}$ rd. = $\frac{15}{2}$ rd.; $\frac{15}{2} \times \frac{1}{2} = \frac{15}{4}$ rd., contents of the lot;
 $\frac{1600}{121} \times \$5 = \$132\frac{80}{121}$, price paid; $\frac{1600}{121}$ rd. $\times \frac{9}{4} = \frac{3600}{121}$ rd. = 14400ft.; $14400 \times \$0.05 = \$720 = \$112\frac{80}{121}$; $\frac{3600}{121}$ rd. : $\frac{3600}{121}$ rd. :: $\$100 : \$272\frac{1}{2}$; $\$272\frac{1}{2} - \$100 = \$172\frac{1}{2}$ = 172½ per cent., Ans.
3. (ART. 256, p. 254.) $120 \times \$0.30 = \$36.00$, price paid; $\$100 : \$90 :: \$36.00 : \$32.40$ Ans.
4. 7cwt. 3qr. 12lb. = 880lb.; $\$100 : \$120 :: \$88 : \$105.60$, $\$105.60 \div 880 = \$0.12$ per pound, Ans.
5. $\$100 : \$112 :: \$1728 : \$1935.36$; $\$1935.36 \times 1.04 = \$2012.77+$, worth of $\$1935.36$, 8 months hence, Ans.
6. $\$100 : \$110 :: \$4.00 : \$4.40$, price sold at; 32gal. — 8gal. = 24gal.; $\$4.40 \div 24 = \$0.18\frac{1}{3}$, price per gallon, Ans.
7. $\$90 \div 1.03 = \$87.37+$, present worth of $\$90$, due 6 months hence; $\$100 : \$120 :: \$87.37+ : \$104.84+$, Ans.
8. $\$11.50 \times 7 = \$80.50$; $\$100 : \$85 :: \$80.50 : \$68.42+$, Ans.
3. (ART. 257, p. 255.) $\$100 - \$62.50 = \$37.50$; $\$37.50 : \$100 :: \$80 : \$213.33\frac{1}{3}$, Ans.
4. $\$100 + \$20 = \$120$; $\$120 : \$100 :: \$7.20 : \$6.00$ per cord, Ans.
5. $\$100 + \$18 = \$118$; $\$118 : \$100 :: \$1600.00 : \$1355.93+$, Ans.
6. $\$8 \times 17 = \$136$; $\$136 \times .0155 = \$2.108$, discount of $\$136$ for 3 months; $\$136 - \$2.108 = \$133.89+$

present worth of \$ 136, due 3 months hence ; \$ 100 —
\$ 10 = \$ 90 ; \$ 90 : \$ 900 :: \$ 133.89+ : \$ 148.76+ ,
Ans.

2. (ART. 258, p. 256.) \$ 100 + \$ 12 = \$ 112 ; \$ 112 : \$ 100
:: \$ 0.28 : \$ 0.25 ; \$ 0.25 : \$ 0.24 :: \$ 100 : \$ 96 ;
\$ 100 — \$ 96 = \$ 4 = 4 per cent. loss, Ans.
3. \$ 100 — \$ 25 = \$ 75 ; \$ 37.50 : \$ 75 :: \$ 75 : \$ 150 ;
\$ 150 — \$ 100 = \$ 50 = 50 per cent. gain, Ans.
4. \$ 1728 ÷ 1.045 = \$ 1653.58+ , present worth of \$ 1728,
due 9 months hence ; \$ 1653.58+ : \$ 2000 :: \$ 110 :
\$ 133+ ; \$ 133+ — \$ 100 = \$ 33+ = 33+ per cent.
gain, Ans.

MISCELLANEOUS EXERCISES.

1. (p. 257.) \$ 84.00 : \$ 75.60 :: \$ 100 : \$ 90 ; \$ 100 —
\$ 90 = \$ 10 = 10 per cent. loss, Ans.
2. \$ 100 — \$ 10 = \$ 90 ; \$ 75.60 : \$ 97.44 :: \$ 90 : \$ 116 ;
\$ 116 — \$ 100 = \$ 16 = 16 per cent. loss, Ans.
3. \$ 100 + \$ 16 = \$ 116 ; \$ 97.44 : \$ 75.60 :: \$ 116 : \$ 90 ;
\$ 100 — \$ 90 = \$ 10 = 10 per cent. loss, Ans. \$ 116 :
\$ 100 :: \$ 97.44 : \$ 84, real value of the horse ; \$ 84 —
\$ 75.60 = \$ 8.40, actual loss, Ans.
4. \$ 5 ÷ \$ 1.045 = \$ 4.78+ , present worth of \$ 5, due 9
months hence ; \$ 100 + \$ 12 = \$ 112 ; \$ 100 : \$ 112
:: \$ 4.78+ : \$ 5.35+ , Ans.
5. \$ 100 + \$ 10 = \$ 110 ; \$ 100 : \$ 110 :: \$ 40 : \$ 44, price
sold at ; 120gal. — 20gal. = 100gal. ; \$ 44.00 ÷ 100 =
\$ 0.44 per gallon, Ans.
6. \$ 5 : \$ 7.50 :: \$ 100 : \$ 150 ; \$ 150 — \$ 100 = \$ 50 =
50 per cent., Jones's gain ; \$ 0.10 : \$ 0.14 :: \$ 100 :
\$ 140 ; \$ 140 — \$ 100 = \$ 40 = 40 per cent., Crosby's
gain ; 50 — 40 = 10 per cent., Jones's gain more than
Crosby's, Ans.
7. \$ 0.30 × 40 = \$ 12.00 ; 30 cents on the dollar = $\frac{30}{100}$ of
the sum to be paid ; \$ 12.00 × $\frac{30}{100}$ = \$ 3.60, price

received for 40gal. ; 160gal. — 40gal. = 120gal. ;
 $\$0.35 \times 120 = \$42.00$, price received for 120gal. ;
 $\$42.00 + \$3.60 = \$45.60$, price received for 160gal. ;
 $\$100 + \$10 = \$110$; $\$110 : \$100 :: 45.60 :$
 $\$41.45+$, Ans.

8. $\$100 - \$10 = \$90$; $\$90 : \$100 :: \$75.60 : \$84.00$,
 real value of the horse ; $\$100 + \$16 = \$116$;
 $\$100 : \$116 :: \$84 : \$97.44$, received for the horse ;
 $\$75.60 : \$97.44 :: \$100 : \$128\frac{2}{3}$; $\$128\frac{2}{3} - \$100$
 $= \$28\frac{2}{3} = 28\frac{2}{3}$ per cent. gained, Ans.

9. $1\frac{1}{2}$ yd. = 1.75 ; 5 per cent. = $\frac{1}{20}$; $\frac{188}{100} - \frac{1}{20} = \frac{186}{100}$;
 $1.75\text{yd.} \times \frac{186}{100} = 1.6625\text{yd.}$, width after shrinking ;
 $70\text{yd.} \times \frac{186}{100} = 66.5\text{yd.}$, length after shrinking ; $66.5\text{yd.} \times$
 $1.6625 = 110.55+$ square yards after shrinking ; $\$4.50$
 $\times 70 = \$315.00$, price paid ; $\$100 + \$12 = \$112$;
 $\$100 : \$112 :: \$315.00 : \$352.80$, price sold at ;
 $\$352.80 \div 110.55+ = \$3.19+$, price per sq. yd., Ans.

DUODECIMALS.

(ART. 260, p. 258.)

(1.)	(2.)	(3.)	(4.)
$\begin{array}{r} \text{ft.} \quad ' \quad '' \\ 12 \quad 6 \quad 9 \\ 14 \quad 7 \quad 8 \\ 165 \quad 11 \quad 10 \\ \hline 193 \quad 2 \quad 3 \end{array}$	$\begin{array}{r} \text{ft.} \quad ' \quad '' \quad '' \\ 182 \quad 11 \quad 2 \quad 4 \\ 127 \quad 7 \quad 8 \quad 11 \\ 291 \quad 5 \quad 11 \quad 10 \\ \hline 602 \quad 0 \quad 11 \quad 1 \end{array}$	$\begin{array}{r} \text{ft.} \quad ' \quad '' \\ 204 \quad 7 \quad 9 \\ 114 \quad 10 \quad 6 \\ \hline 89 \quad 9 \quad 3 \end{array}$	$\begin{array}{r} \text{ft.} \quad ' \quad '' \quad '' \quad '' \\ 397 \quad 9 \quad 6 \quad 11 \quad 7 \\ 201 \quad 11 \quad 7 \quad 8 \quad 10 \\ \hline 195 \quad 9 \quad 11 \quad 2 \quad 9 \end{array}$

(ART. 262, p. 260.)

(2.)	(3.)	(4.)
$\begin{array}{r} \text{ft.} \quad ' \\ 8 \quad 3 \\ 7 \quad 9 \\ \hline 57 \quad 9 \\ 6 \quad 2 \quad 3 \\ \hline 63 \quad 11 \quad 3 \end{array}$	$\begin{array}{r} \text{ft.} \quad ' \\ 12 \quad 9 \\ 9 \quad 11 \\ \hline 114 \quad 9 \\ 11 \quad 8 \quad 3 \\ \hline 126 \quad 5 \quad 3 \end{array}$	$\begin{array}{r} \text{ft.} \quad ' \quad '' \\ 14 \quad 9 \quad 11 \\ 6 \quad 11 \quad 8 \\ \hline 88 \quad 11 \quad 6 \\ 13 \quad 7 \quad 1 \quad 1 \\ 9 \quad 10 \quad 7 \quad 4 \\ \hline 103 \quad 4 \quad 5 \quad 8 \quad 4 \end{array}$

KEY TO

$$\begin{array}{r}
 \text{(5.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 161 \quad 8 \quad 6 \\
 \hline
 7 \quad 10 \\
 \hline
 1131 \quad 11 \quad 6 \\
 134 \quad 9 \quad 1 \\
 \hline
 1266 \quad 8 \quad 7
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(6.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 87 \quad 1 \quad 11 \\
 \hline
 5 \quad 7 \quad 5 \\
 \hline
 435 \quad 9 \quad 7 \\
 50 \quad 10 \quad 1 \quad 5 \\
 \hline
 3 \quad 0 \quad 3 \quad 9 \quad 7 \\
 \hline
 489 \quad 8 \quad 0 \quad 2 \quad 7
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(7.)} \\
 \begin{array}{r}
 \text{ft.} \\
 18 \\
 \hline
 1 \quad 10 \\
 \hline
 18 \\
 15 \quad 0 \\
 \hline
 33 \quad 0
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(8.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 19 \quad 8 \\
 2 \quad 11 \\
 \hline
 39 \quad 4 \\
 18 \quad 0 \quad 4 \\
 \hline
 57 \quad 4 \quad 4
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(9.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 18 \quad 9 \\
 10 \quad 6 \\
 \hline
 187 \quad 6 \\
 9 \quad 4 \quad 6 \\
 \hline
 196 \quad 10 \quad 6
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \text{(10.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 14 \quad 9 \\
 12 \quad 6 \\
 \hline
 27 \quad 3 \\
 2 \\
 \hline
 54 \quad 6 \\
 7 \quad 9 \\
 \hline
 381 \quad 6 \\
 40 \quad 10 \quad 6 \\
 \hline
 422 \quad 4 \quad 6
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 14 \quad 9 \\
 12 \quad 6 \\
 \hline
 177 \quad 0 \\
 7 \quad 4 \quad 6 \\
 \hline
 184 \quad 4 \quad 6 \\
 2 \\
 \hline
 368 \quad 9 \quad 0 \\
 422 \quad 4 \quad 6 \\
 \hline
 791 \quad 1 \quad 6
 \end{array}
 \end{array}$$

[Ans.]

$$\begin{array}{r}
 \text{(11.)} \\
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 3 \quad 8 \\
 1 \quad 9 \\
 \hline
 3 \quad 8 \\
 2 \quad 9 \\
 \hline
 6 \quad 5 \\
 2 \\
 \hline
 12 \quad 10 \\
 7 \quad 4 \\
 3 \quad 2 \\
 \hline
 23 \quad 4 \\
 12
 \end{array}
 \end{array}$$

280 0 Ans.

$$\begin{array}{r}
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 1 \quad 2 \\
 2 \\
 \hline
 1 \quad 0 \\
 3 \quad 8 \\
 \hline
 3 \quad 0 \\
 8 \\
 \hline
 3 \quad 8 \\
 2 \\
 \hline
 7 \quad 4
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 1 \quad 9 \\
 2 \\
 \hline
 1 \quad 7 \\
 1 \quad 0 \\
 \hline
 1 \quad 7 \\
 2 \\
 \hline
 3 \quad 2
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 \begin{array}{r}
 \text{ft.} \quad \text{in.} \\
 3 \quad 8 \\
 2 \\
 \hline
 3 \quad 6 \\
 1 \quad 7 \\
 \hline
 3 \quad 6 \\
 2 \quad 0 \quad 6 \\
 \hline
 5 \quad 6 \quad 6 \\
 1 \quad 0 \\
 \hline
 5 \quad 6 \quad 6 \\
 12
 \end{array}
 \end{array}$$

66 6 0 =
[66ft. 864in.]

(12.)		(13.)	
rods.	ft.	ft.	
18	924	56	
10	$3\frac{1}{2} \times 4 = 14$	5	6
28	938	280	
2	4	28	
56	3752	32)308(9 $\frac{1}{2}$ cords, Ans.	
16 $\frac{1}{2}$	3 $\frac{1}{2}$	288	
336	11256	20	
56	1876		
28	13132	(14.)	
924	5592	ft. in.	
$4 \times 2 = 8$	Ans. 7540	23	8
932		3	9
3		71	0
	(15.)	17	9
2796.	ft.	32)88	9(2 $\frac{22}{125}$ cords, Ans.
2	97	12	64
5592	7	384	24
	679		12
	3 8		297
	2037	3)384	$= 1\frac{22}{125}$
	452 8		
128)2489	8(19 cords 3 $\frac{1}{2}$ ft. Ans.		
128		(17.)	
1209		ft. ft. in. ft. in. ft.	
1152		12 6 6 5 6 12	
16)57(3		11 2 6 3 6 11	
12 48		23 13 0 16 6 23	
192 9		2 3 3 2 9 2	
12		46 16 3 19 3 46	
	116 = $2\frac{2}{3}$	7 $\frac{1}{2}$ 2 3 5	
	192 = $4\frac{2}{3}$	322 32 6 57 9 41 0	
(16.)		23 32 6 32 6 8	
ft. in.		9)345	
3 9		38 $\frac{1}{2}$	
8		13 $\frac{7}{10}$	
30 0		9)117 7	
30)128(4 $\frac{4}{5}$ ft. Ans.		13 $\frac{7}{10}$	
120		25 $\frac{22}{105}$ yd. Ans.	
8			

INVOLUTION.

(ART. 264, p. 262.)

1. $6 \times 6 = 36$ Ans. 6. $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$ Ans.
 2. $5 \times 5 \times 5 = 125$ Ans. [Ans. 7. $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} =$
 $\frac{1}{32}$ Ans.]
 3. $4 \times 4 \times 4 \times 4 \times 4 = 4096$ 8. $25 \times 25 \times 25 = .015625$
 4. $3 \times 3 \times 3 \times 3 = 81$ Ans. 9. 17. Ans. [Ans.
 5. $\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \frac{8}{27}$ Ans.]

2. (ART. 265, p. 263.) $5, 25, 125; 125 \times 25 \times 25 = 78125$
 3. $6, 36, 216; 216 \times 216 \times 216 = 10077696$ Ans. [Ans.
 4. $7, 49, 343, 2401; 2401 \times 343 \times 343 \times 49 = 13841287201$
 5. $8, 64, 512; 512 \times 512 \times 64 = 16777216$ Ans. [Ans.
 6. $4, 16, 64, 256, 1024; 1024 \times 1024 = 1048576 \times 1048576$
 $= 1099511627776$ Ans.
 7. $3, 9, 27, 81, 243, 729, 2187, 6561, 19683, 59049; 59049$
 $\times 59049 \times 59049 = 205891132094649$ Ans.
 8. $2, 4, 8, 16, 32, 64, 128, 256, 512, 1024; 1024 \times 1024 \times$
 $1024 \times 1024 \times 1024 = 1125899906842624$ Ans.

EXTRACTION OF THE SQUARE ROOT.

(ART. 268, p. 267.)

(3.)	(4.)	(5.)
516961(719	182329(427	23804641(4879
49	16	16
141)269	82)223	88)780
141	164	704
1429)12861	847)5929	967)7646
12861	5929	6769
		9749)87741
		87741

(6.) $\begin{array}{r} 10673289(3267 \\ 9 \\ \hline 62)167 \\ 124 \\ \hline 646)4332 \\ 3876 \\ \hline 6527)45689 \\ 45689 \end{array}$	(7.) $\begin{array}{r} 20894041(4571 \\ 16 \\ \hline 85)489 \\ 425 \\ \hline 907)6440 \\ 6349 \\ \hline 9141)9141 \\ 9141 \end{array}$	(8.) $\begin{array}{r} 42025(205 \\ 4 \\ \hline 405)2025 \\ 2025 \end{array}$
(9.) $\begin{array}{r} 1014049(1007 \\ 1 \\ \hline 2007)014049 \\ 014049 \end{array}$	(10.) $\begin{array}{r} 538(23.194+ \\ 4 \\ \hline 43)138 \\ 129 \\ \hline 461)900 \\ 461 \\ \hline 4629)43900 \\ 41661 \\ \hline 46384)223900 \\ 185536 \\ \hline 38364 \end{array}$	(11.) $\begin{array}{r} 71(8.426+ \\ 64 \\ \hline 164)700 \\ 656 \\ \hline 1682)4400 \\ 3364 \\ \hline 16846)103600 \\ 101076 \\ \hline 2524 \end{array}$
(12.) $\begin{array}{r} 7(2.645+ \\ 4 \\ \hline 46)300 \\ 276 \\ \hline 524)2400 \\ 2096 \\ \hline 5285)30400 \\ 26425 \\ \hline 3975 \end{array}$	(13.) $\begin{array}{r} .1024(.32 \\ 9 \\ \hline 62)124 \\ 124 \end{array}$	(14.) $\begin{array}{r} .3364(.58 \\ 25 \\ \hline 108)864 \\ 864 \end{array}$
(15.) $\begin{array}{r} .8950(.946+ \\ 81 \\ \hline 184)850 \\ 736 \\ \hline 1886)11400 \\ 11316 \\ \hline 84 \end{array}$	(16.) $\begin{array}{r} .120409(.347 \\ 9 \\ \hline 64)304 \\ 256 \\ \hline 687)4809 \\ 4809 \end{array}$	

10 *

(17.)

$$\begin{array}{r} 61723020.96(7856.4 \\ \underline{49} \end{array}$$

$$\begin{array}{r} 148)1272 \\ \underline{1184} \end{array}$$

$$\begin{array}{r} 1565)8830 \\ \underline{7825} \end{array}$$

$$\begin{array}{r} 15706)100520 \\ \underline{94236} \end{array}$$

$$\begin{array}{r} 157124)628496 \\ \underline{628496} \end{array}$$

(18.)

$$\begin{array}{r} 9754.60423716(98.7654 \\ \underline{81} \end{array}$$

$$\begin{array}{r} 188)1654 \\ \underline{1504} \end{array}$$

$$\begin{array}{r} 1967)15060 \\ \underline{13769} \end{array}$$

$$\begin{array}{r} 19746)129142 \\ \underline{118476} \end{array}$$

$$\begin{array}{r} 197525)1066637 \\ \underline{987625} \end{array}$$

$$\begin{array}{r} 1975304)7901216 \\ \underline{7901216} \end{array}$$

(ART. 269, p. 267.)

$$\begin{array}{r} (1.) \\ \sqrt{49} \end{array}$$

$$\begin{array}{r} 49(7 \\ \underline{49} \end{array}$$

$$\begin{array}{r} 529(23 \\ \underline{4} \end{array}$$

$$\begin{array}{r} 43)129 \\ \underline{129} \end{array}$$

 $\frac{7}{17}$ Ans.

$$\begin{array}{r} (2.) \\ \sqrt{196} \end{array}$$

$$\begin{array}{r} 196(14 \\ \underline{1} \end{array}$$

$$\begin{array}{r} 24)96 \\ \underline{96} \end{array}$$

$$\begin{array}{r} 625(25 \\ \underline{4} \end{array}$$

$$\begin{array}{r} 45)225 \\ \underline{225} \end{array}$$

 $\frac{14}{14}$ Ans.

$$\begin{array}{r} (3.) \\ \sqrt{3721} \end{array}$$

$$\begin{array}{r} 3721(61 \\ \underline{36} \end{array}$$

$$\begin{array}{r} 121)121 \\ \underline{121} \end{array}$$

$$\begin{array}{r} 7569(87 \\ \underline{64} \end{array}$$

$$\begin{array}{r} 167)1169 \\ \underline{1169} \end{array}$$

 $\frac{87}{87}$ Ans.

$$\begin{array}{r} (4.) \\ \sqrt{1849} \end{array}$$

$$\begin{array}{r} 1849(43 \\ \underline{16} \end{array}$$

$$\begin{array}{r} 83)249 \\ \underline{249} \end{array}$$

$$\begin{array}{r} 12769(113 \\ \underline{1} \end{array}$$

$$\begin{array}{r} 21)27 \\ \underline{21} \end{array}$$

$$\begin{array}{r} 223)669 \\ \underline{669} \end{array}$$

 $\frac{113}{113}$ Ans.

$$\begin{array}{r} (5.) \\ 60\frac{1}{15} = 4\frac{1}{3} \end{array}$$

$$\begin{array}{r} 961(31 \\ \underline{9} \end{array}$$

$$\begin{array}{r} 61)61 \\ \underline{61} \end{array}$$

$$\begin{array}{r} 16(4 \\ \underline{16} \end{array}$$

 $\frac{31}{4} = 7\frac{3}{4}$ Ans.

$$\begin{array}{r} (6.) \\ 28\frac{1}{4} = 14\frac{1}{2} \end{array}$$

$$\begin{array}{r} 1849(43 \\ \underline{16} \end{array}$$

$$\begin{array}{r} 83)249 \\ \underline{249} \end{array}$$

$$\begin{array}{r} 64(8 \\ \underline{64} \end{array}$$

 $\frac{43}{8} = 5\frac{3}{8}$ Ans.

$$\begin{array}{r} (7.) \\ 47\frac{1}{4} = 11\frac{3}{4} \end{array}$$

$$\begin{array}{r} 3025(55 \\ \underline{25} \end{array}$$

$$\begin{array}{r} 105)525 \\ \underline{525} \end{array}$$

$$\begin{array}{r} 64(8 \\ \underline{64} \end{array}$$

 $\frac{55}{8} = 6\frac{7}{8}$ Ans.

$$\begin{array}{r}
 \text{(8.)} \\
 4\frac{2}{3} = .736842 + (.858 + \\
 \quad \quad \quad 64 \\
 \quad \quad \quad 165 \overline{)968} \\
 \quad \quad \quad \quad 825 \\
 \quad \quad \quad \quad \hline
 1708 \overline{)14342} \\
 \quad \quad \quad \quad 13664 \\
 \quad \quad \quad \quad \hline
 \quad \quad \quad \quad 678
 \end{array}$$

$$\begin{array}{r}
 \text{(9.)} \\
 83\frac{2}{3} = 83.6666 + (9.14 + \\
 \quad \quad \quad 81 \\
 \quad \quad \quad 181 \overline{)266} \\
 \quad \quad \quad \quad 181 \\
 \quad \quad \quad \quad \hline
 1824 \overline{)8566} \\
 \quad \quad \quad \quad 7296 \\
 \quad \quad \quad \quad \hline
 \quad \quad \quad \quad 1270
 \end{array}$$

$$\begin{array}{r}
 \text{(10.)} \\
 121\frac{1}{4} = 121.94444 + (11.042 + \\
 \quad \quad \quad 1 \\
 \quad \quad \quad 21 \overline{)21} \\
 \quad \quad \quad \quad 21 \\
 \quad \quad \quad \quad \hline
 2204 \overline{)9444} \\
 \quad \quad \quad \quad 8816 \\
 \quad \quad \quad \quad \hline
 22082 \overline{)62844} \\
 \quad \quad \quad \quad 44164 \\
 \quad \quad \quad \quad \hline
 \quad \quad \quad \quad 18680
 \end{array}$$

$$\begin{array}{r}
 \text{(11.)} \\
 \frac{339\frac{2}{3}}{462} = \frac{337\frac{2}{3}}{462} = \frac{3\frac{2}{3}}{4\frac{2}{3}}; \sqrt{\frac{3\frac{2}{3}}{4\frac{2}{3}}} = \frac{2}{3} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 \text{(12.)} \\
 \frac{761\frac{2}{3}}{1557\frac{2}{3}} = \frac{1000}{20750} = \frac{4}{81}; \sqrt{\frac{4}{81}} = \frac{2}{9} \text{ Ans.}
 \end{array}$$

APPLICATION OF THE SQUARE ROOT.

(ART. 270, p. 268.)

1. $\sqrt{226576} = 476$ Ans.
2. 640 acres = 102400 rods; $\sqrt{102400} = 320$ rods, Ans.
3. $125 \times 53 = 6625$ rd.; $62\frac{1}{2} \times 34 = 2125$ rd.; $37 \times 160 = 5920$ rd.; $6625 \div 2125 \div 5920 = 14670$ rd.; $\sqrt{14670} = 121.11 +$ rods, Ans.
4. $242 \times 242 = 58564$ feet, area of the first lot; $58564 \times 9 = 527076$. $\sqrt{527076} = 726$ feet, Ans.

5. $124A. \times 160 = 19840$ rods, area of the former pasture;
 $4 : 5 :: 19840 : 24800$, area of the latter; $\sqrt{24800} =$
 $157.48 + \text{rd.}$, Ans.
6. $2 : 3 :: 216 : 324$; $\sqrt{324} = 18$ trees in length; $3 : 2 ::$
 $216 : 144$; $\sqrt{144} = 12$ trees in breadth; $18 - 1 =$
 17 ; $17 \times 25 = 425 \text{ft.}$; $12 - 1 = 11$; $11 \times 25 =$
 275ft. ; $425 \times 275 = 116875 \text{ sq. ft.}$, Ans.

1. (ART. 275, p. 269.) $40 \times 40 = 1600$; $9 \times 9 = 81$;
 $1600 + 81 = 1681$; $\sqrt{1681} = 41 \text{ft.}$, Ans.
2. $360 \times 360 = 129600$; $450 \times 450 = 202500$; $129600 +$
 $202500 = 332100$; $\sqrt{332100} = 576.2 + \text{miles}$, Ans.
3. $60 \times 60 = 3600 \text{ft.}$; $36 \times 36 = 1296 \text{ft.}$; $3600 - 1296 =$
 2304ft. ; $\sqrt{2304} = 48 \text{ feet}$, Ans.
4. $120 \times 120 = 14400 \text{ft.}$; $50 \times 50 = 2500 \text{ft.}$; $14400 -$
 $2500 = 11900 \text{ft.}$; $\sqrt{11900} = 109.08 + \text{feet}$, Ans.
5. $160 + 20 = 180$; $180 \times 180 = 32400$; $500 \times 500 =$
 250000 ; $250000 - 32400 = 217600$; $\sqrt{217600} =$
 $466.47 +$; $466.47 + - 100 = 366.47 + \text{feet}$, Ans.
6. $110 + 90 = 200$; $300 \times 300 = 90000$; $200 \times 200 =$
 40000 ; $90000 - 40000 = 50000$; $\sqrt{50000} = 223.6 + \text{ft.}$;
 $223.6 + - 160 = 63.6 + \text{feet}$, Ans.
7. $60 \times 60 = 3600$; $80 \times 80 = 6400$; $3600 + 6400 =$
 10000 ; $\sqrt{10000} = 100$; $70 \times 70 = 4900$; $4900 +$
 $6400 = 11300$; $\sqrt{11300} = 106.30 +$; $90 \times 90 =$
 8100 ; $8100 + 4900 = 13000$; $\sqrt{13000} = 114.01 +$;
 $8100 + 3600 = 11700$; $\sqrt{11700} = 108.16 +$; $100 +$
 $106.30 + 114.01 + 108.16 = 428.47 + \text{rods}$, Ans.
8. $24 \times 24 = 576 \text{ft.}$; $18 \times 18 = 324 \text{ft.}$; $576 + 324 =$
 900ft. ; $12 \times 12 = 144$; $900 + 144 = 1044 \text{ft.}$;
 $\sqrt{1044} = 32.3 + \text{feet}$, Ans.

- 2 (ART. 279, p. 271.) $16 : 8 :: 16^2 : 128$; $\sqrt{128} =$
 $11.31 + \text{feet}$, Ans.

3. $11 : 33 :: 11^2 : 363$; $\sqrt{363} = 19.05+$ rods, Ans.
 4. $28.3 : 42.5 :: 6^2 : 54.06+$; $\sqrt{54.06+} = 7.35+$ feet, Ans.
 5. $2000 : 4000 :: 3^2 : 18$; $\sqrt{18} = 4.24+$ inches, Ans.
 6. $1000 : 5000 :: 4^2 : 80$; $\sqrt{80} = 8.94+$ inches, Ans.
 7. $12^2 : 8^2 :: 72 : 32$ rods, Ans.
 8. $45^2 : 15^2 :: 950 : 105.55+$ square rods, Ans.
 9. $6^2 : 9^2 :: 1.178+ : 2.65+$ feet, Ans.
 10. $3^2 : 2^2 :: 20\frac{1}{2} : 9$ minutes, Ans.
 11. $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$; $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$; $\frac{9}{16} - \frac{1}{4} = \frac{5}{16}$; $\frac{5}{16} : \frac{9}{16} :: 50 : 62\frac{1}{2}$ minutes, Ans.
1. (ART. 280, p. 272.) $12^2 = 144$; $144 \div 2 = 72$; $\sqrt{72} = 8.48+$ feet, Ans.
 2. $30^2 = 900$; $900 \div 2 = 450$; $\sqrt{450} = 21.2+$ inches square, Ans.
 3. $1.5 \times 1.5 = 2.25$; $2.25 \div 2 = 1.1250$; $\sqrt{1.1250} = 1.06+$ inches, Ans.

EXTRACTION OF THE CUBE ROOT.

(ART. 282, p. 276.)

(2.)	(3.)
$74088(42$ 64 	$185193(57$ 125
$4^3 \times 300 = 4800)10088$ 	$5^3 \times 300 = 7500)60193$
$4800 \times 2 = 9600$ $2^3 \times 30 \times 4 = 480$ $2 \times 2 \times 2 = 8$ 	$7500 \times 7 = 52500$ $7^3 \times 30 \times 5 = 7350$ $7 \times 7 \times 7 = 343$
10088	60193

(4.)

80621568(432

64

$$4^3 \times 300 = 4800)16621$$

$$4800 \times 3 = 14400$$

$$3^3 \times 30 \times 4 = 1080$$

$$3 \times 3 \times 3 = \underline{27}$$

15507

$$43^3 \times 300 = 554700)1114568$$

$$554700 \times 2 = 1109400$$

$$2^3 \times 30 \times 43 = 5160$$

$$2 \times 2 \times 2 = \underline{8}$$

1114568

(5.)

176558481(561

125

$$5^3 \times 300 = 7500)51558$$

$$7500 \times 6 = 45000$$

$$6^3 \times 30 \times 5 = 5400$$

$$6 \times 6 \times 6 = \underline{216}$$

50616

$$56^3 \times 300 = 940800)942481$$

$$940800 \times 1 = 940800$$

$$1^3 \times 30 \times 56 = 1680$$

$$1 \times 1 \times 1 = \underline{1}$$

942481

(6.)

257259456(636

216

$$6^3 \times 300 = 10800)41259$$

$$10800 \times 3 = 32400$$

$$3^3 \times 30 \times 6 = 1620$$

$$3 \times 3 \times 3 = \underline{27}$$

34047

$$63^3 \times 300 = 1190700)7212456$$

$$1190700 \times 6 = 7144200$$

$$6^3 \times 30 \times 63 = 68040$$

$$6 \times 6 \times 6 = \underline{216}$$

7212456

(7.)

1860867(123

1

$$1^3 \times 300 = 300)860$$

$$300 \times 2 = 600$$

$$2^3 \times 30 \times 1 = 120$$

$$2 \times 2 \times 2 = \underline{8}$$

728

$$12^3 \times 300 = 43200)132867$$

$$43200 \times 3 = 129600$$

$$3^3 \times 30 \times 12 = 3240$$

$$3 \times 3 \times 3 = \underline{27}$$

132867

(8.)

1879080904(1234

1

$$1^3 \times 300 = 300 \underline{)879}$$

$$300 \times 2 = 600$$

$$2^3 \times 30 \times 1 = 120$$

$$2 \times 2 \times 2 = \underline{8}$$

728

$$12^3 \times 300 = 43200 \underline{)151080}$$

$$43200 \times 3 = 129600$$

$$3^3 \times 30 \times 12 = \underline{3240}$$

$$3 \times 3 \times 3 = \underline{27}$$

132867

$$123^3 \times 300 = 4538700 \underline{)18213904}$$

$$4538700 \times 4 = 18154800$$

$$4^3 \times 30 \times 123 = \underline{59040}$$

$$4 \times 4 \times 4 = \underline{64}$$

18213904

(9.)

41673648.563(346.7

27

$$3^3 \times 300 = 2700 \underline{)14673}$$

$$2700 \times 4 = 10800$$

$$4^3 \times 30 \times 3 = \underline{1440}$$

$$4 \times 4 \times 4 = \underline{64}$$

12304

$$34^3 \times 300 = 346800 \underline{)2369648}$$

(Carried forward.)

KEY TO

(Brought forward.)

$$34^3 \times 300 = 346800)2369648$$

$$346800 \times 6 = 2080800$$

$$6^3 \times 30 \times 34 = 36720$$

$$6 \times 6 \times 6 = 216$$

$$2117736$$

$$346^3 \times 300 = 35914800)251912563$$

$$35914800 \times 7 = 251403600$$

$$7^3 \times 30 \times 346 = 508620$$

$$7 \times 7 \times 7 = 343$$

$$251912563$$

(10.)

$$483921.516051(78.51$$

$$343$$

$$7^3 \times 300 = 14700)140921$$

$$14700 \times 8 = 117600$$

$$8^3 \times 30 \times 7 = 13440$$

$$8 \times 8 \times 8 = 512$$

$$131552$$

$$78^3 \times 300 = 1825200)9369516$$

$$1825200 \times 5 = 9126000$$

$$5^3 \times 30 \times 78 = 58500$$

$$5 \times 5 \times 5 = 125$$

$$9184625$$

$$785^3 \times 300 = 184867500)184891051$$

$$184867500 \times 1 = 184867500$$

$$1^3 \times 30 \times 785 = 23550$$

$$1 \times 1 \times 1 = 1$$

$$184891051$$

(11.)

$$\dot{8}.14486\dot{5}72\dot{8}(2.012$$

8

$$20^2 \times 300 = 120000)144865$$

$$120000 \times 1 = 120000$$

$$1^2 \times 30 \times 20 = 600$$

$$1 \times 1 \times 1 = 1$$

$$\underline{120601}$$

$$201^2 \times 300 = 12120300)24264728$$

$$12120300 \times 2 = 24240600$$

$$2^2 \times 30 \times 201 = 24120$$

$$2 \times 2 \times 2 = 8$$

$$\underline{24264728}$$

(12.)

$$.075686967(.423$$

64

$$4^2 \times 300 = 4800)11686$$

$$4800 \times 2 = 9600$$

$$2^2 \times 30 \times 4 = 480$$

$$2 \times 2 \times 2 = 8$$

$$\underline{10088}$$

$$42^2 \times 300 = 529200)1598967$$

$$529200 \times 3 = 1587600$$

$$3^2 \times 30 \times 42 = 11340$$

$$3 \times 3 \times 3 = 27$$

$$\underline{1598967}$$

(13.)

$$25(2.92+$$

8

$$2^2 \times 300 = 1200)17000$$

$$1200 \times 9 = 10800$$

$$9^2 \times 30 \times 2 = 4860$$

$$9 \times 9 \times 9 = 729$$

$$\underline{16389}$$

$$29^2 \times 300 = 252300)611000$$

$$252300 \times 2 = 504600$$

$$2^2 \times 30 \times 29 = 3480$$

$$2 \times 2 \times 2 = 8$$

$$\underline{508088}$$

$$102912$$

(ART. 282, p. 277.)

(1.)

$$81\frac{1}{11} = \frac{81.454545454(4.334 + \frac{64}{64})}{64}$$

$$4^2 \times 300 = 4800 \overline{)17454}$$

$$4800 \times 3 = 14400$$

$$3^2 \times 30 \times 4 = 1080$$

$$3 \times 3 \times 3 = 27$$

$$\underline{15507}$$

$$43^2 \times 300 = 554700 \overline{)1947545}$$

$$554700 \times 3 = 1664100$$

$$3^2 \times 30 \times 43 = 11610$$

$$3 \times 3 \times 3 = 27$$

$$\underline{1675737}$$

$$433^2 \times 300 = 56246700 \overline{)271808454}$$

$$56246700 \times 4 = 224986800$$

$$4^2 \times 30 \times 433 = 255840$$

$$4 \times 4 \times 4 = 64$$

$$\underline{225242704}$$

$$46565750$$

(2.)

$$^3\sqrt{729} = \frac{9}{18} \text{ Ans.}$$

$$\begin{array}{r} 729 \\ 729 \\ \hline \end{array}$$

$$\underline{729}$$

$$4096 \overline{)16}$$

$$\underline{1}$$

$$1^2 \times 300 = 300 \overline{)3096}$$

$$300 \times 6 = 1800$$

$$6^2 \times 30 \times 1 = 1080$$

$$6 \times 6 \times 6 = 216$$

$$\underline{3096}$$

(3.)

$$49\frac{8}{27} = 1\frac{331}{27};$$

$$^3\sqrt{1331} = \frac{11}{3} = 3\frac{2}{3} \text{ Ans.}$$

$$1331 \overline{)11}$$

$$\underline{1}$$

$$27 \overline{)3}$$

$$\underline{27}$$

$$1^2 \times 300 = 300 \overline{)331}$$

$$300 \times 1 = 300$$

$$1^2 \times 30 \times 1 = 30$$

$$1 \times 1 \times 1 = 1$$

$$\underline{331}$$

(4.) $166\frac{2}{3} = 133\frac{1}{3};$ $\sqrt[3]{133\frac{1}{3}} = 5\frac{1}{2} = 5\frac{1}{2} \text{ Ans.}$ $\begin{array}{r} 1331(11 \quad 8(2 \\ 1 8 \end{array}$ $\begin{array}{r} 1^3 \times 300 = 300 \overline{)331} \\ 300 \times 1 = 300 \\ 1^3 \times 30 \times 1 = 30 \\ 1 \times 1 \times 1 = 1 \\ \hline 331 \end{array}$	(5.) $85\frac{2}{3} = 128\frac{2}{3};$ $\sqrt[3]{128\frac{2}{3}} = 5\frac{1}{3} = 4\frac{2}{3} \text{ Ans.}$ $\begin{array}{r} 10648(22 \\ 8 \end{array}$ $\begin{array}{r} 2^3 \times 300 = 1200 \overline{)2648} \\ 1200 \times 2 = 2400 \\ 2^3 \times 30 \times 2 = 240 \\ 2 \times 2 \times 2 = 8 \\ \hline 2648 \end{array}$
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1. (ART. 283, p. 277.) $\sqrt[3]{2744} = 14$ feet, Ans.
2. $268\frac{4}{5} \times 8 = 2150\frac{2}{5}$ cubic inches in 1 gallon; $2150\frac{2}{5} \times 400 = 860160$ cubic inches $= 497\frac{1}{5}$ cubic feet in 400 bushels; $\sqrt[3]{497.777} + \text{ft.} = 7.92 + \text{ft.}$, Ans.
3. $18 \times 15 \times 10 = 2700 \text{ft.}$; $\sqrt[3]{2700 \text{ft.}} = 13.92 + \text{ft.}$, Ans.
2. (ART. 288, p. 278.) $2^3 = 8 : 12^3 = 1728 :: \$6.25$
\$ 1350 Ans.
3. $4^3 = 64 : 6^3 = 216 :: 50 : 168.7 + \text{lb.}$, Ans.
4. $16 : 8 :: 12^3 = 1728 : 864$; $\sqrt[3]{864} = 9.5 +$; $12 - 9.5 + = 2.5 + \text{in.}$, Ans.
5. $6^3 = 216 : 7^3 = 343 :: 800 : 1270.3 + \text{lb.}$, Ans.
6. $1^3 : 2^3 = 8 :: 1 : 8$ cords, Ans.
7. $30^3 = 27000 : 40^3 = 64000 :: 1000 : 2370.3 + \text{lb.}$, Ans.
8. $6^3 = 216 : 12^3 = 1728 :: 16 : 128$ ounces, Ans.
9. $15^3 = 3375$; $3375 \times \frac{2}{3} = 2250$; $\sqrt[3]{2250} = 13.1 + \text{feet}$,
Ans.

ARITHMETICAL PROGRESSION.

2. (ART. 290, p. 280.) $\frac{55-7}{17-1} = 3$ Ans.
3. $\frac{14-4}{15-1} = 1\frac{1}{4} = \frac{5}{4}$ Ans. | 4. $\frac{17-9}{10-1} = \frac{8}{9}$ miles, Ans.

2. (ART. 291, p. 281.) $\$51 + \$7 \times 6 = \$348$ Ans.

3. $\frac{198 \times 99}{2} = 9801$ rods, Ans.

2. (ART. 292, p. 282.) $\frac{47-8}{3} + 1 = 14$ days, Ans.

(ART. 293, p. 283.)

2. $\frac{137-12}{5} + 1 = 26$; $\frac{137+12 \times 26}{2} = 1937$ lines, Ans.

2. (ART. 294, p. 284.) $12-1 \times 2 + 7 = 29$ miles, Ans.

3. $10-1 \times 1\frac{1}{2} = 13\frac{1}{2}$; $20\frac{1}{2} - 13\frac{1}{2} = 6\frac{3}{4}$ miles, Ans.

2. (ART. 296, p. 285.) $(6-1) \times \$15 + \$250 = \$325$;
 $250 + 325 \times 3 = \$1725$ Ans.

3. $(10-1) \times \$19 + \$380 = \$551$; $551 + 380 \times 5 =$
 $\$4655$ Ans.

4. $(8-1) \times \$49.50 + \$825 = \$1171.50$; $1171.50 + 825$
 $\times 4 = \$7986$ Ans.

5. $\$100 \times .08 \times 2\frac{1}{2} = \$20$; $\$100 \times .08 \times 2 = \$16$;
 $\$100 \times .08 \times 1\frac{1}{2} = \$12$; $\$100 \times .08 = \$8$;
 $\$100 \times .04 = \$4$; $\$200 \times 3 = \$600$;
 $\$600 + \$20 + \$16 + \$12 + \$8 + \$4 = \$660$ Ans.

6. $(8-1) \times \$42 + \$700 = \$994$; $994 + 700 \times 4 =$
 $\$6776$; $\$6776 - \$100 = \$6676$ Ans.

7. $(12-1) \times \$0.50 + \$50 = \$55.50$; $55.50 + 50 \times 6$
 $= \$633$ Ans.

GEOMETRICAL PROGRESSION.

2. (ART. 298, p. 287.) $5^6 = 15625$; $15625 \times 4 = 62500$ Ans.

3. $\frac{1}{4}^6 = \frac{1}{4096}$; $\frac{1}{4096} \times 28672 = \frac{28672}{4096} = 7$ Ans.

4. $4^7 = 16384$; $16384 \times 5 = 81920$ Ans.

5. $20^4 = 160000$; $160000 \times 10 = 1600000$ Ans. [Ans.

6. $1.06^5 = 1.3382255776$; $1.3382255776 \times 30 = 40.146767328$

$$7. 1.06^8 = 1.3382255776 ; 1.3382255776 \times \$1728 = \$2312.453798 + \text{Ans.} \quad [\text{Ans.}]$$

$$8. 1.05^4 = 1.21550625 ; 1.21550625 \times \$328.90 = \$399.78 +$$

$$9. 3^4 = 4782969 ; 4782969 \times \$0.05 = \$239148.45 \text{ Ans.}$$

$$3. (\text{ART. 299, p. 289.}) \frac{4^7 - 1}{4 - 1} \times 8 = 43688 \text{ Ans.}$$

$$4. \frac{1 - \frac{2}{3}^5}{1 - \frac{2}{3}} \times 10 = \frac{7810}{278} = 30\frac{44}{278} \text{ Ans.}$$

$$5. \frac{1.06^4 - 1}{1.06 - 1} \times 18 = 78.743 + \text{Ans.}$$

$$6. \frac{1.05^5 - 1}{1.05 - 1} \times \$144 = \$795.6909 \text{ Ans.}$$

$$7. 1\frac{2}{3} = \frac{5}{3} ; \frac{\frac{5}{3}^6 - 1}{\frac{5}{3} - 1} = \frac{7448}{31} = \$91\frac{7}{31} \text{ Ans.}$$

$$8. \frac{4^{10} - 1}{4 - 1} \times \$0.01 = \$3495.25 \text{ Ans.}$$

$$2. (\text{ART. 301, p. 291.}) \frac{1.05^4 - 1}{1.05 - 1} \times \$1728 = \$7447.89,6 + \text{Ans.}$$

$$3. \frac{1.06^7 - 1}{1.06 - 1} \times \$87 = \$730.26,3 + \text{Ans.}$$

$$4. \frac{1.06^8 - 1}{1.06 - 1} \times \$500 = \$3487.65,9 + \text{Ans.}$$

$$5. \frac{1.06^{10} - 1}{1.06 - 1} \times \$96 = \$1265.35,6 + \text{Ans.}$$

$$6. \frac{1.06^9 - 1}{1.06 - 1} \times \$1000 = \$3183.60 \text{ Ans.}$$

$$7. \frac{1.06^9 - 1}{1.06 - 1} \times \$56 = \$470.05,4 + \text{Ans.}$$

$$8. \frac{1.05^7 - 1}{1.05 - 1} \times \$25 = \$203.55 ; \frac{1.06^{10} - 1}{1.06 - 1} \times \$20 =$$

$$\$263.61,5 + ; \$263.61,5 - \$203.55 = \$60.06,5 + ,$$

William receives more than Samuel, Ans.

$$9. \frac{1.05^{14} - 1}{1.05 - 1} \times \$10 = \$195.98,6 + \text{Ans.}$$

ALLIGATION.

(2.)	(ART. 304, p. 292.)	(3.)
$\$0.20 \times 30 = \$6.00$		$\$0.40 \times 4 = \$1.60$
$\$0.25 \times 40 = \$10.00$		$\$0.85 \times 8 = \$6.80$
$\$0.30 \times 70 = \$21.00$		$\$1.00 \times 12 = \$12.00$
$\$0.40 \times 80 = \$32.00$		$\$1.50 \times 10 = \$15.00$
220gal. \$69.00		34bu. \$35.40
$\$69 \div 220 = \$0.31\frac{1}{4}$ Ans.		$\$35.40 \div 34 = \$1.04\frac{2}{7}$ Ans.

(4.)

$$\begin{aligned} \$0.10 \times 30 &= \$3.00 \\ \$0.12 \times 25 &= \$3.00 \\ \$0.15 \times 4 &= \$0.60 \\ \$0.20 \times 50 &= \$10.00 \\ 109\text{lb.} & \$16.60 \\ \$16.60 \div 109 &= \$0.15\frac{2}{3} \text{ Ans.} \end{aligned}$$

(ART. 306, p. 294.)

(3.)

$$42 \left\{ \begin{array}{l} 25 \\ 30 \\ 40 \\ 50 \end{array} \right. \left\{ \begin{array}{l} 8 \\ 8 \\ 8 \end{array} \right. \left. \vphantom{\begin{array}{l} 25 \\ 30 \\ 40 \\ 50 \end{array}} \right\} \text{Ans.}$$

$$17 + 12 + 2 = 31$$

(4.)

$$18 \left\{ \begin{array}{l} 12 \\ 15 \\ 20 \end{array} \right. \left\{ \begin{array}{l} 2 \\ 2 \\ 6 \end{array} \right. \left. \vphantom{\begin{array}{l} 12 \\ 15 \\ 20 \end{array}} \right\} \text{Ans.}$$

$$6 + 3 = 9$$

(ART. 307, p. 295.)

(2.)

$$1.25 \left\{ \begin{array}{l} 50 \\ 60 \\ 1.50 \\ 1.70 \end{array} \right. \left\{ \begin{array}{l} 45 \\ 25 \\ 65 \\ 75 \end{array} \right. \left\{ \begin{array}{l} 75 : 45 :: 30 : 18\text{bu. of oats,} \\ 75 : 25 :: 30 : 10\text{bu. of peas,} \\ 75 : 65 :: 30 : 26\text{bu. of beans,} \end{array} \right\} \text{Ans.}$$

(3.)

$$\begin{aligned} .10 \times 1.25 &= .12\frac{1}{2} \\ .12 \times 1.25 &= .15 \\ .15 \times 1.25 &= .18\frac{1}{2} \end{aligned}$$

$$14 \left\{ \begin{array}{l} 12\frac{1}{2} \\ 15 \\ 18\frac{1}{2} \end{array} \right. \left\{ \begin{array}{l} 1 \\ 1\frac{1}{2} \\ 1\frac{1}{2} \end{array} \right. \left. \vphantom{\begin{array}{l} 12\frac{1}{2} \\ 15 \\ 18\frac{1}{2} \end{array}} \right\} 1 + 4\frac{1}{2} = 5\frac{1}{2}$$

$$\left\{ \begin{array}{l} 1\frac{1}{2} : 5\frac{1}{2} :: 100 : 383\frac{1}{3}\text{lb.} \\ 1\frac{1}{2} : 1\frac{1}{2} :: 100 : 100\text{lb.} \end{array} \right\} \text{Ans.}$$

(ART. 308, p. 296.)

$$\begin{array}{r}
 (2.) \\
 1.80 \left\{ \begin{array}{l} 0.00 \\ 2.00 \\ 2.50 \end{array} \right. \begin{array}{l} .70 + .20 = .90 \\ 1.80 \\ 1.80 \end{array} \\
 \hline
 4.50
 \end{array}$$

$$\begin{array}{l}
 4.50 : .90 :: 100 : 20 \text{ bushels of chaff,} \\
 4.50 : 1.80 :: 100 : 40 \text{ bushels of wheat,} \\
 4.50 : 1.80 :: 100 : 40 \text{ bushels of rye,}
 \end{array} \left. \vphantom{\begin{array}{l} 4.50 : .90 \\ 4.50 : 1.80 \\ 4.50 : 1.80 \end{array}} \right\} \text{Ans.}$$

$$\begin{array}{r}
 (3.) \\
 \begin{array}{l} .20 \times 1.10 = .22 \\ .30 \times 1.10 = .33 \end{array} 25 \left\{ \begin{array}{l} 22 \\ 33 \end{array} \right. \begin{array}{l} 8 \\ 3 \end{array} \begin{array}{l} 11 : 8 :: 80 : 58 \frac{2}{3} \text{ gal.} \\ 11 : 3 :: 80 : 21 \frac{1}{3} \text{ gal.} \end{array} \left. \vphantom{\begin{array}{l} 22 \\ 33 \end{array}} \right\} \text{Ans.} \\
 \hline
 11
 \end{array}$$

$$\begin{array}{r}
 (4.) \\
 12 \left\{ \begin{array}{l} 10 \\ 15 \end{array} \right. \begin{array}{l} 3 \\ 2 \end{array} \begin{array}{l} 5 : 3 :: 60 : 36 \text{ thousand,} \\ 5 : 2 :: 60 : 24 \text{ thousand,} \end{array} \left. \vphantom{\begin{array}{l} 10 \\ 15 \end{array}} \right\} \text{Ans.} \\
 \hline
 5
 \end{array}$$

PERMUTATION.

2. (ART. 310, p. 297.) $1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 = 362880$ days = 994 years, 70 days, Ans.
3. $12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 479001600$; 1 to 479001600 Ans.
4. $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$ words, Ans.

MENSURATION OF SURFACES.

1. (ART. 314, p. 299.) $18 \div 2 = 9$; $24 \times 9 = 216$ ft. Ans.
2. $50 + 60 + 70 = 180$; $180 \div 2 = 90$; $90 - 50 = 40$; $90 - 60 = 30$; $90 - 70 = 20$; $90 \times 40 \times 30 \times 20 = 2160000$; $\sqrt{2160000} = 1469.69 +$ rods, Ans.
1. (ART. 317, p. 300.) $25 \times 3 = 75$ feet, Ans.
2. $37 \times 27 = 999$ ft.; $40 \times 20 = 800$ ft.; $999 - 800 = 199$ ft.
3. $15 \times 12 = 180$ ft. Ans. [Ans.]

1. (ART. 319, p. 301.) $482 + 324 = 806\text{ft.}$; $806 \div 2 = 403$;
 $403 \times 216 = 87048$ square feet, Ans.
 2. $28 + 20 = 48\text{in.}$; $48 \div 2 = 24\text{in.} = 2\text{ft.}$; $2 \times 22 = 44$
 square feet, Ans.
 1. (ART. 321, p. 301.) $65 \times \frac{1}{2} = 455$; $65 \times \frac{1}{2} = 585$;
 $455 + 585 = 1040$ square feet, Ans.
 2. $125 \times \frac{1}{2} = 4375$; $125 \times \frac{1}{2} = 5312.5$; $4375 + 5312.5 =$
 9687.5 square rods, Ans.
 1. (ART. 324, p. 302.) $35 \times 5 = 175$; $175 \times 24.22 = 2107$
 square feet, Ans.
 2. $20 \times 6 = 120$; $120 \times 17.32 = 1039.20$ square feet, Ans.
 1. (ART. 326, p. 302.) $3.141592 \times 50 = 157.0796 + \text{ft.}$ Ans.
 2. $3.141592 \times 100 = 314.15 + \text{rods}$, Ans.
 1. (ART. 327, p. 302.) $.318309 \times 80 = 25.46 + \text{miles}$, Ans.
 2. $.318309 \times 62.84 = 20 + \text{feet}$, Ans.
 1. (ART. 328, p. 303.) $200 \times 200 \times .785398 = 31415.92$
 square feet, Ans.
 2. $400 \times 400 \times .079577 = 12732 + \text{p.} = 79\text{A. } 2\text{R. } 12 + \text{p.}$ Ans.
 1. (ART. 329, p. 303.) $40 \times .886227 = 35.44 + \text{rods}$, Ans.
 2. $100 \times .282094 = 28.2 + \text{rods}$, Ans.
 1. (ART. 330, p. 304.) $30 \times .707106 = 21.21 + \text{inches}$, Ans.
 2. $100 \times .225079 = 22.5 + \text{rods square}$, Ans.
- [Ans.
1. (ART. 332, p. 304.) $14 \times 10 \times .785398 = 109.95 + \text{sq. in.}$
 2. $8 \times 5 \times .785398 = 31.415 + \text{ft.} = 31 \text{ sq. ft. } 59 \text{ sq. in.}$ Ans.

MENSURATION OF SOLIDS.

1. (ART. 335, p. 305.) $3 \times 3 = 9$; $9 \times 15 = 135$; $3 + 3 +$
 $3 = 9 \div 2 = 4.5$; $4.5 - 3 = 1.5$; $1.5 \times 1.5 \times 1.5 \times$
 $4.5 = 15.1975$; $\sqrt{15.1975} = 3.895 +$; $3.895 \times 2 =$
 $7.79 +$; $135 + 7.79 + = 142.79 + \text{square feet}$, Ans.

2. $9 \times 4 = 36$; $36 \times 25 = 900$; $9 \times 9 = 81$; $81 \times 2 = 162$;
 $900 + 162 = 1062$ square feet, Ans.

1. (ART. 336, p. 306.) $5 + 4 + 3 = 12$; $12 \div 2 = 6$; $6 - 5 = 1$; $6 - 4 = 2$; $6 - 3 = 3$; $1 \times 2 \times 3 \times 6 = 36$;
 $\sqrt{36} = 6$; $20 \times 6 = 120$ cubic feet, Ans.

2. $8 \times 8 \times 8 = 512$ cubic feet, Ans.

3. $30 \times 20 \times 10 = 6000$ cubic feet, Ans.

1. (ART. 338, p. 306.) $3 \times 4 = 12$; $3 \times 3 \times .079577 = .716+$;
 $.716 \times 2 = 1.43+$; $12 + 1.43+ = 13.43$ square feet, Ans.

2. $2 \times 3.141592 = 6.283184$; $6.283184 \times 12 = 75.39$ sq. ft.
 [Ans.]

1. (ART. 339, p. 306.) $2 \times 2 \times .785398 = 3.141592$; $3.141592 \times 8 = 25.13+$ cubic feet, Ans.

2. $5 \times 5 \times .785398 = 19.63495$; $19.63495 \times 20 = 392.69$ ft.
 [Ans.]

1. (ART. 342, p. 307.) $100\text{ft.} = 1200\text{in.}$; $54\text{ft.} = 648\text{in.}$;
 $1200 \div 2 = 600$; $648 \times 600 = 388800$; $388800 \div 27 = 14400\text{in.} = 400$ yards, Ans.

2. $50 \div 2 = 25$; $25 \times 12 = 300$ square feet, Ans.

1. (ART. 343, p. 307.) $693 \times 693 = 480249$; $480249 \times 500 = 240124500$;
 $240124500 \div 3 = 80,041,500$ cubic feet;
 $80,041,500 \div 8 = 10,005,187.5$ feet; $10,005,187.5 \div 5280 = 1894.9$ miles, Ans.

2. $5 \times 5 \times .785398 = 19.6349$; $19.6349 \times 30 = 589.04$;
 $589.04 \div 3 = 196.3$ feet, Ans.

1. (ART. 346, p. 308.) $8 \times 4 = 32$; $4 \times 4 = 16$; $32 + 16 = 48$;
 $48 \times 20 = 960$; $960 \div 2 = 480$; $8 \times 8 = 64$;
 $4 \times 4 = 16$; $64 + 16 = 80$; $480 + 80 = 560$ sq. ft. Ans.

2. $18 + 9 = 27$; $27 \times 12 = 324$; $324 \div 2 = 162$; $18 \times 18 \times .079577 = 25.78+$;
 $9 \times 9 \times .079577 = 6.44+$;
 $25.78 + 6.44 = 32.22+$; $162 + 32.22+ = 194.22+$ square feet, Ans.

1. (ART. 347, p. 308.) $20 \times 20 = 400$; $10 \times 10 = 100$;
 $400 \times 100 = 40000$; $\sqrt{40000} = 200$; $200 + 400 +$
 $100 = 700$; $700 \times 30 = 21000$; $21000 \div 3 = 7000$
cubic feet, Ans.
2. $12 \times 12 \times .785398 = 113.097+$; $6 \times 6 \times .785398 = 28.274$;
 $113.097 \times 28.274 = 3197.704578$; $\sqrt{3197.704578} =$
 $56.548+$; $56.548 + 113.097 + 28.274 = 197.919+$ in.
 $= 1.3744+$ ft.; $1.3744+ \times 20 = 27.488+$; $27.488+$
 $\div 3 = 9.162+$ feet, Ans.
1. (ART. 349, p. 309.) $3.141592 \times 20 = 62.83+$; $62.83+$
 $\times 20 = 1256.6+$ square inches, Ans.
2. $3.141592 \times 8000 = 25132.736$; $25132.736 \times 8000 =$
 201061888 square miles, Ans.
1. (ART. 350, p. 309.) $20 \times 20 \times 20 \times .523598 =$
 $4188.7+$ inches, Ans.
2. $5 \times 5 \times 5 \times .523598 = 65.44+$ cubic feet, Ans.
1. (ART. 351, p. 309.) $10 \times 10 = 100$; $100 \div 3 = 33.33+$;
 $\sqrt{33.33+} = 5.773+$ inches, Ans. [Ans.]
2. $30 \times 30 = 900$; $900 \div 3 = 300$; $\sqrt{300} = 17.32+$ feet,
1. (ART. 353, p. 310.) $20 \times 20 \times 30 \times .523598 = 6283.17+$
cubic feet, Ans.
2. $30 \times 30 \times 10 \times .523598 = 4712.38+$ cubic feet, Ans.

MENSURATION OF LUMBER AND TIMBER.

1. (ART. 355, p. 310.) $16 \times 18 = 288$ in.; 288 in. $\div 12 =$
 24 feet, Ans.
2. $24 \times 30 = 720$ in.; 720 in. $\div 12 = 60$ feet, Ans.
1. (ART. 356, p. 310.) $4 \times 3 \times 12 = 144$ in.; 144 in. $\div 12$
 $= 12$ feet, Ans.
2. $10 \times 10 \times 25 = 2500$ in.; $2500 \div 12 = 208\frac{1}{3}$ feet, Ans.

1. (ART. 357, p. 311.) $60 \div 4 = 15$; $15 \times 15 = 225$;
 $225 \times 50 = 11250$; $11250 \div 144 = 78\frac{1}{2}$ cubic ft., Ans.
2. $30 \div 4 = 7.5$; $7.5 \times 7.5 \times 30 = 1687.50$; $1687.50 \div$
 $144 = 11.7\frac{1}{2}$ solid feet, Ans.

MISCELLANEOUS EXAMPLES.

(PAGE 311.)

1. 100cts. : 10cts. :: 72d. : $7\frac{1}{2}$ d.; $7\frac{1}{2} - 7 = \frac{1}{2}$ d. Ans.
2. $7\frac{1}{2} = 7\frac{1}{2}$; $7\frac{1}{2} - \frac{1}{2} = 7\frac{1}{2}$ Ans.
3. $4\frac{1}{2} = 4\frac{1}{2}$; $3\frac{1}{2} = 3\frac{1}{2}$; $4\frac{1}{2} + 3\frac{1}{2} = 7\frac{1}{2}$ Ans.
4. $5\frac{1}{2} \times 5 = 27\frac{1}{2}$; $27\frac{1}{2} - 3\frac{1}{2} = 23\frac{1}{2}$ Ans.
5. $\frac{1}{11}$ m. = $\frac{1}{11} \times \frac{1}{2} = \frac{1}{22} = 5\frac{1}{11}$ fur.; $\frac{1}{11}$ fur. = $\frac{1}{11} \times \frac{4}{1} = \frac{4}{11}$
 $3\frac{1}{11}$ rd.; $\frac{1}{11}$ rd. = $\frac{1}{11} \times \frac{3}{2} = \frac{3}{22} = 10\frac{1}{2}$ ft.; $\frac{1}{2} \times \frac{1}{2} =$
 $\frac{1}{2} = 6$ in.; $\frac{1}{2}$ fur. = $\frac{1}{2} \times \frac{4}{1} = 2\frac{1}{2} = 31\frac{1}{2}$ rd.; $\frac{1}{2} \times \frac{3}{2}$
 $= \frac{3}{4} = 1\frac{1}{4}$ ft.; $\frac{1}{4}$ ft. = $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8} = 10$ in.

fur.	rd.	ft.	in.
5	3	10	6
	31	1	10
4	12	8	8 Ans.

6. $\frac{2}{11}$ R. = $\frac{2}{11} \times \frac{4}{1} = \frac{8}{11} = 32\frac{8}{11}$ p.; $\frac{2}{11}$ p. = $\frac{2}{11} \times 2\frac{1}{2} =$
 $= 2\frac{1}{11} = 198$ feet.

A.	R.	p.	ft.	in.
7	0	0	0	0
		32	198	0
6	3	7	74	0
			$\frac{1}{2} = 36$	
6	3	7	74	36 Ans.

7. $7 : 12 :: \frac{3}{8} : \frac{3}{8} = 3\frac{1}{2}$ h., time Swift will travel the distance;
 $5 : 12 :: \frac{1}{11} : \frac{1}{11} = 5\frac{1}{11}$ h., time Slow will travel the distance;
 $3\frac{1}{2} - 5\frac{1}{11} = 1\frac{1}{11}$ h.; $1\frac{1}{11} \times \frac{60}{1} \times \frac{60}{1} = 1\frac{1}{11} \times 3600 =$
 $12\frac{1}{11}$ sec. Ans.

8. $\frac{1}{4}T. = \frac{1}{8} \times 2^2 = 1^2 \text{ cwt.}; 1^2 \text{ cwt.} : \frac{1}{4} \text{ cwt.} :: \$49.$
 $\frac{1}{100} \times \frac{1}{4} \times 4^2 = \$3.92 \text{ Ans.}$
9. $8 \times 4 \times 2 = 64$; $1728 \div 64 = 27$, number of bricks in a cubic foot; $40 \times 20 \times 2 = 1600$ cubic feet in the wall.
 $1600 \times 27 = 43200$ bricks, Ans.
10. $80 + 40 = 120$; $120 \times 2 = 240$ feet round the house;
 from this sum we deduct 4 feet for the corners; $240 - 4 = 236$; $236 \times 25 \times 27 = 159300$ bricks, Ans.
11. $18 \times 12 \times 144 = 31104$, number of square inches in the floor; $8 \times 8 = 64$ square inches in a tile; $31104 \div 64 = 486$ tiles, Ans.
12. $11 \text{ cwt. } 3 \text{ qr. } 19 \text{ lb.} = 1335 \text{ lb.}; 83 \text{ cwt. } 2 \text{ qr. } 11 \text{ lb.} = 9363 \text{ lb.};$
 $\left. \begin{array}{l} 1335 \text{ lb.} : 9363 \text{ lb.} \\ 46 \text{ m.} : 96 \text{ m.} \end{array} \right\} :: \$18.25 : \$267.12 \frac{41}{100}$
 $9363 \times 96 \times 18.25 = 16403976.00$; $1335 \times 46 = 61410$; $16403976 \div 61410 = \$267.12 \frac{41}{100}$ Ans.
13. $\$100 - \$25 = \$75$; $\$75 : \$100 :: \$24 : 32$, value of the cloth; $\$34 - \$32 = \$2$; $\$32 : \$2 :: \$100 : \$6 \frac{1}{2}$ Ans.
14. $120 - 20 = 100$ gallons remaining; $\$30 + \$10 = \$40$, price to be obtained; $100 \text{ gals.} : 1 \text{ gal.} :: \$40 : \$0.40$ Ans.
15. $117 \frac{1}{2} = 2 \frac{1}{2}$; $112 \frac{1}{2} = 10 \frac{1}{2}$; $2 \frac{1}{2} \times 10 \frac{1}{2} = 26 \frac{1}{4} = 26 \frac{1}{4} \times 20 = 525 \frac{1}{2}$
 $13178 \frac{1}{2} \text{ rods} = 82 \text{ A. } 1 \text{ R. } 18 \text{ p. } 2 \text{ yd. } 7 \text{ ft. } 133 \frac{1}{2} \text{ in.}$ Ans.
16. $\$128.25 \times 1.03 = \$132.0975$; $\$132.0975 \times 1.06 = \$140.02 \frac{1}{2}$ Ans.
17. $27 \text{ bu.} : 36 \text{ bu.} :: \$8.75 : \$11.66 \frac{1}{2}$ Ans.
18. $\$1.25 \times 93 = \$116.25$; $\$116.25 \div \$0.50 = 232 \frac{1}{2}$
 bushels, Ans. [Ans.]
19. $\$1.25 \times 75 = \$93.75$; $\$93.75 \div 1.30 = 72 \frac{1}{4}$ bushels,
20. $\frac{1}{2}$ of $24 \text{ h.} = 8 \text{ h.}$; $\frac{1}{4}$ of $24 \text{ h.} = 6 \text{ h.}$; $8 + 6 + 2 + 6 = 22 \text{ h.}$; $24 \text{ h.} - 22 \text{ h.} = 2$ hours, Ans.
21. $\frac{1}{4}$ of $24 \text{ h.} = 6 \text{ h.}$; $\frac{1}{5}$ of $24 \text{ h.} = 4 \frac{4}{5} \text{ h.}$; $\frac{1}{6}$ of $24 \text{ h.} = 4 \text{ h.}$; $\frac{1}{7}$ of $24 \text{ h.} = 3 \frac{3}{7} \text{ h.}$; $6 + 4 \frac{4}{5} + 4 + 3 \frac{3}{7} + 2 = 20 \frac{8}{35} \text{ h.}$; $24 \text{ h.} - 20 \frac{8}{35} \text{ h.} = 3 \frac{27}{35} \text{ hours}$, Ans.

22. $7\frac{1}{2} = \frac{14}{2}$; $5\frac{1}{2} = \frac{11}{2}$; $\frac{14}{2} \times \frac{11}{2} = \frac{154}{2}$; 160rd. : $\frac{154}{2}$ rd.

$$\therefore \$25.75 : \frac{1}{16} \times \frac{931}{45} \times \frac{103}{1} = \frac{2575}{144} = \$6.65\frac{11}{144}, \quad [\text{Ans.}]$$

(23.) $5\frac{1}{2}$ E.E. : $71\frac{1}{2}$ yd. :: \$15.16

$$\begin{array}{r} 5 \\ 28 \end{array} \quad \begin{array}{r} 4 \\ 287 \\ 15.16 \\ 1722 \\ 287 \\ 1435 \\ 287 \end{array}$$

$28 \overline{)4350.92} (\$155.39 \text{ Ans.})$

24. $5\frac{1}{2}$ ft. : 4ft. :: 150ft. : $107\frac{1}{2}$ feet, Ans.

25. \$100 : \$150 :: 6m. : 9m. Ans.

26. $\$1.20 \times 150 = \$180.00$, sum paid by the polls;
 $\$6045.50 - \$180.00 = \$5865.50$ to be paid on valuation;
 $\$293275 : \$5865.50 :: \$1.00 : \$0.02$ on a dollar;
 $\$1.00 : \$0.02 :: \$3675 : \$73.50$; $\$1.20 \times 4 = \$4.80$;
 $\$4.80 + \$73.50 = \$78.30$ Ans.

27. 2cwt. 3qr. 11lb. = 319lb.; $319\text{lb.} \times 97 = 30943\text{lb.}$;
 $3\text{c. } 17\text{s. } 9\text{d.} = 933\text{d.}$; $112\text{lb.} : 30943\text{lb.} :: 933\text{d.} :$
 $257766\frac{2}{3}\text{d.}$; $257766\frac{2}{3}\text{d.} = 1074\text{c. } 0\text{s. } 6\frac{2}{3}\text{d.}$ Ans.

(28.)

$$\begin{array}{r} \text{y.} \quad \text{mo.} \quad \text{d.} \\ 1842 \quad 9 \quad 29 \\ 1840 \quad 1 \quad 9 \\ \hline 2 \quad 8 \quad 20 \\ \hline \quad \quad 5358 \\ \quad 10716 \\ \quad 1786 \\ \quad \quad 595 \\ \hline \quad 291713 \\ \quad \quad 7\frac{1}{2} \\ \hline 2041991 \\ \quad 72928 \\ \hline 6 \overline{)21.14919} \\ \text{Ans. } \$3.52,476 \end{array}$$

(29.)

$$\begin{array}{r} \text{y.} \quad \text{mo.} \quad \text{d.} \\ 1842 \quad 8 \quad 25 \\ 1840 \quad 0 \quad 7 \\ \hline 2 \quad 8 \quad 18 \\ \hline \quad \quad 29361 \\ \quad \quad 58722 \\ \quad \quad 9787 \\ \hline \quad 15.95281 \\ \quad \quad 9 \\ \hline 6 \overline{)143.57529} \\ \text{Ans. } \$23.92,921 \end{array}$$

30. $80 \times 30 = 900$; $900 \div 3 = 300$; $\sqrt{300} = \text{length of one side of the cube}$; $\sqrt{300} \times \sqrt{300} \times 6 = 1800 \text{ inches, Ans.}$

(31.)

Principal bearing interest from Oct. 29, 1836,	. \$ 1000.00
Compound interest on \$ 1000 from Oct. 29, 1836,	
to Oct. 29, 1842, 6 years,	. 418.51
Amount of principal to Oct. 29, 1842,	. 1418.51
First payment, Jan. 1, 1837,	. \$ 125.00
Compound interest from Jan. 1, 1837, to	
Oct. 29, 1842, 5y. 9m. 28d.,	. 50.58
Second payment, June 5, 1837,	. 316.00
Compound interest from June 5, 1837,	
to Oct. 29, 1842, 5y. 4m. 24d.,	. 117.02
Third payment, Sept. 25, 1837,	. 417.00
Compound interest from Sept. 25, 1837,	
to Oct. 29, 1842, 5y. 1m. 4d.,	. 144.20
Fourth payment, April 1, 1838,	. 100.00
Compound interest from April 1, 1838,	
to Oct. 29, 1842, 4y. 6m. 28d.,	. 30.62
Fifth payment, July 5, 1838,	. 50.00
Compound interest from July 5, 1838, to	
Oct. 29, 1842, 4y. 3m. 24d.,	. 14.30
Amount of indorsements,	. \$ 1364.72
Balance due Oct. 29, 1842,	. \$ 53.79

32. $23\frac{1}{2} = 16\frac{1}{2}$; $16\frac{1}{2} = 2\frac{3}{4}$; $16\frac{1}{2} \times 2\frac{3}{4} = 44\frac{1}{2} = 388\frac{1}{2}\text{ft.}$;
 $13\frac{1}{2} = 2\frac{1}{2}$; $2\frac{1}{2} \times 2\frac{3}{4} = 21\frac{1}{4} = 223\frac{1}{2}\text{ft.}$; $7\frac{1}{2} \times 2 = 14\frac{1}{2}$;
 $388\frac{1}{2} - 14\frac{1}{2} = 374\frac{1}{2} = 78\frac{1}{2}$; $223\frac{1}{2} - 14\frac{1}{2} = 209\frac{1}{2} = 42\frac{1}{2}$;
 $78\frac{1}{2} \times 42\frac{1}{2} = 3341\frac{1}{4} = 7822\frac{1}{4}\text{ square feet} = 1\text{A. } 3\text{R. } 7\text{p. } 85\frac{1}{4}\text{ft. Ans.}$

33. $100 \times 80 = 8000 \text{ square feet in the garden}$; $100 + 80 = 180$;
 $180 \times 2 = 360\text{ft.}$ To this we add 4 feet for each corner = 16ft.; $360 + 16 = 376\text{ft.}$, length of the ditch;
 $376 \times 4 = 1504\text{ft.}$, superficial contents of the ditch;
 $8000 \div 1504 = 5\frac{1}{4} \text{ feet, depth of the ditch, Ans.}$

34. $15\frac{1}{2} \times 12 = 186\text{in.}$; $11\frac{1}{2} \times 12 = 135\text{in.}$; $7\frac{3}{4} \times 12 = 93\text{in.}$; $186 + 135 = 321$; $321 \times 2 = 642$; $642 \times 93 = 59706$ square inches; $59706 \div 30 = 1990\frac{1}{5}$; $1990\frac{1}{5} \div 36 = 55\frac{1}{5}\frac{1}{2}\text{yd. Ans.}$
35. $15\frac{1}{2} + 11\frac{1}{2} = 26\frac{1}{2}$; $26\frac{1}{2} \times 2 = 53\frac{1}{2} = 107$; $7\frac{3}{4} = 15\frac{1}{2}$; $107 \times 15\frac{1}{2} = 1657$; $15\frac{1}{2} = 31$; $11\frac{1}{2} = 23$; $23 \times 31 = 713$; $1657 + 713 = 2370$ square feet; $2370 \div 9 = 263\frac{2}{3}$ square yards; $263\frac{2}{3} \times 10 = \$6.54\frac{2}{3}$ Ans.
36. $40 \times 40 = 1600$; $1600 \div 3 = 533.33\frac{1}{3}$; $\sqrt{533.33\frac{1}{3}} = 23.09401$; $533.33\frac{1}{3} \times 23.09401 = 12316.8 +$ Ans.
37. $32 : 4 :: 18.5^3 : 791.453125$; $\sqrt[3]{791.453125} = 9.25 = 9\frac{1}{4}$ inches wide; $32 : 4 :: 8^3 : 64$; $\sqrt[3]{64} = 4$ inches deep, Ans.
38. As $\frac{1}{3}$ of the estate was given to the wife, $\frac{2}{3}$ of the estate will remain. The eldest son has $\frac{1}{4}$ of the $\frac{2}{3} = \frac{1}{6}$. The wife and son will therefore have $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ of the estate. The daughter is to have $\frac{1}{3}$ of the residue; that is, $\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{6}$. Therefore the wife, son, and daughter, will have $\frac{1}{3}$, $\frac{1}{6}$, and $\frac{1}{6} = \frac{1}{2}$; and $\frac{1}{2} - \frac{1}{2} = 0$ will remain to be divided among the other heirs. But, if $\frac{1}{6}$, the daughter's portion, is $\$151.33\frac{1}{3}$, $\frac{1}{6}$, the residue, will be 5 times as much, that is, 5 times $\$151.33\frac{1}{3} = \$756.66\frac{2}{3}$ Ans.

OPERATION.

$$\frac{1}{6} : \frac{1}{6} :: \$151.33\frac{1}{3} : \$756.66\frac{2}{3} \text{ Ans.}$$

39. If the son receives $\frac{1}{4}$, there will remain $\frac{2}{3} - \frac{1}{4} = \frac{5}{12}$; and $\frac{1}{4}$ of $\frac{5}{12} = \frac{5}{48}$ will be the daughter's portion. The son and daughter will receive $\frac{1}{4} + \frac{5}{48} = \frac{17}{48} = \frac{2}{3}$ of the estate; there will therefore remain $\frac{2}{3} - \frac{2}{3} = 0$ for the wife; and the son will receive $\frac{1}{4} - \frac{5}{48} = \frac{7}{48}$ more than the daughter; therefore, $\frac{7}{48} : \frac{5}{48} :: \$100 : \$600$, wife's portion, Ans.
40. $\$1250 - \$500 = \$750$, which was $\frac{1}{4}$ of his capital. He therefore lost $\$750 \div 3 = \$250$ Ans.
41. $\frac{1}{4}$ of $\frac{1}{3} = \frac{1}{12}$; $\frac{1}{4} - \frac{1}{12} = \frac{1}{6}$ Ans.
42. $\$112.50 : \$100 :: \$50 : \$44.44\frac{4}{9}$ Ans.

43. 17cwt. 3qr. 18lb. = 2006lb.; $2006 \times 7\frac{1}{2} = 15045d.$;
 $15045d. = 63s. 13a. 9d. = \$206.95\frac{1}{2}$ Ans.
44. $\$5.00 : \$17.50 :: \frac{1}{4}yd. : \frac{3}{4}yd.$ Ans.
45. 17rd. 10ft. = $290\frac{1}{2}ft.$; $8\frac{1}{2} = 4\frac{1}{2}h.$; therefore, $\frac{7}{7}h. : 4\frac{1}{2}h. ::$
 $290\frac{1}{2}ft. : 6208\frac{1}{2}ft. = 1m. 928\frac{1}{2}ft.$ Ans.
46. $\$11.75 : \$100 :: 2\frac{3}{4}A. : 19A. 1R. 32\frac{1}{2}\frac{3}{4}p.$ Ans.
47. $\$128 - \$70 = \$58$; $\$58 : \$70 :: \$1000$ ·
 $\$1206.89\frac{1}{2}$ Ans.
48. $\$1.218\frac{1}{2} : \$1.00 :: \$1000 : \$820.79\frac{3}{4}\frac{1}{2}$ Ans.
49. $\$97.57 - \$88 = \$9.57$.
 $\$88 : \$100 \left. \vphantom{\begin{matrix} \$88 \\ 18m. \end{matrix}} \right\} :: \$9.57 : \$7\frac{1}{2}$
 $18m. : 12m.$
 $\frac{\$9.57 \times 1000 \times 12}{18 \times 88} = \frac{11484}{1584} = 7\frac{1}{4}$ per cent., Ans.
50. $\frac{3}{4}gal. : 7\frac{1}{4}gal. :: \$87 = \frac{3}{4} : \frac{31}{4} :: \frac{27}{1} = \frac{3}{4} \times \frac{31}{4} \times \frac{27}{1} =$
 $\frac{12411}{4} = \$1051.25$ Ans.
51. $18\frac{3}{4}yd. : 5yd. :: \$71 = \frac{122}{1} : \frac{1}{4} :: \frac{71}{1} = \frac{122}{1} \times \frac{1}{4} \times \frac{71}{1} =$
 $\frac{2482}{122} = \$19.26\frac{1}{2}$ Ans.
52. 18 tons 17cwt. 3qr. = 42308lb.; 112lb. : 42308lb. :: $\$9.50$
 $: \$3588\frac{1}{2}$; $\$4.00 : \$3588\frac{1}{2} :: 1yd. : 897\frac{5}{12}yd.$ Ans.
53. 1bu. : 98bu. :: $\$0.45 : \$44.10$; $\$1.25 : \$44.10 :: 1bu. :$
 $35\frac{7}{5}bu.$ Ans.
54. 86 tons 18cwt. 3qr. 20lb. = 194760lb.; 2240lb. : 194760lb.
 $:: \$8.50 : \$739.04\frac{1}{2}$ = 19A. 2R. $33\frac{2}{3}p.$ Ans.
55. By the question, we find $\frac{1}{4}$ of the time passed from noon
equal to $\frac{1}{11}$ of the time to midnight. We reduce these
fractions to a common denominator, $\frac{1}{4}$ and $\frac{1}{11} = \frac{11}{44}$ and
 $\frac{4}{44}$. When fractions are reduced to a common denom-
inator, their value is as their numerators. Therefore 11
will represent the time passed from noon, and 7 the time
to midnight, and $11 + 7 = 18$ will represent 12 hours;
therefore $7 : 18 :: 12h. : 4h. 40m.$ time from noon, Ans.
56. $200 \times 4 \times 40 \times 272\frac{1}{2} \times 20 = 174,240,000$ feet, Ans.
57. $20000 \times 4 \times 40 \times 272\frac{1}{2} \times 144 \times 3 = 376358400000$
cubic inches; $376358400000 \div 282 = 1334604255\frac{4}{7}$

gallons; $1334604255 \frac{1}{2} \div 100 = 13346042 \text{ hhd. } 55 \text{ gal.},$

$\frac{1}{2} \text{ gal.} = 1 \text{ qt. Opt. } 2 \frac{1}{2} \text{ gi. Ans.}$

58. $1^\circ : 71^\circ 4' :: 4 \text{ min.} : 4 \text{ h. } 44 \text{ m. } 16 \text{ sec.}$

h.	m.	sec.
11	16	0
4	44	16

Ans. 6 31 44

(59.)

$18^\circ \quad 24' \text{ E.}$

$67^\circ \quad 21' \text{ W.}$

$1^\circ : 85^\circ 45' :: 4 \text{ m.}$

$$\begin{array}{r} 60 \\ 60 \end{array}$$

$$\begin{array}{r} 60 \\ 5145 \end{array}$$

$$\begin{array}{r} 4 \end{array}$$

$$60 \overline{)20580}$$

$$60 \overline{)343 \text{ m.}}$$

5h. 43m. 8 53 P. M. Ans.

h.	m.
2	36 A. M.
5	43

NOTE. To perform this question we are obliged to add 12 hours to the minuend, and it brings the time to the evening of the previous day.

(60.)

h.	m.
- 12	0
11	36

$4 \text{ m.} : 24 \text{ m.} :: 1^\circ$

$$\begin{array}{r} 1 \\ 4 \overline{)24} 6^\circ \\ 24 \end{array}$$

$$\begin{array}{r} 16 \\ 6 \end{array} \begin{array}{r} 18 \\ 0 \end{array} \text{ W.}$$

$$\begin{array}{r} 10 \\ 10 \end{array} \begin{array}{r} 18 \\ 18 \end{array} \text{ W.}$$

61. $3000 \times 5280 = 15840000$; $15840000 \div 1142 = 13870 +$

seconds; $13870 \div 60 = 231 \text{ m. } 10 \text{ sec.}$; $231 \div 60 =$

3h. 51m.; 3h. 51m. 10+ sec. Ans.

62. $1142 \times 10 = 11420$; $11420 \div 5280 = 2 \text{ m. } 860 \text{ ft. Ans.}$

63. $2^s = 8 : 3^s = 27 :: \$ 125.00 : \$ 421.87 \frac{1}{2} \text{ Ans.}$

64. $20 - 15 = 5 : 15 :: 10 : 30 \text{ cents, Ans.}$

65. $12 \frac{1}{2} - 10 = 2 \frac{1}{2}$; $10 : 2 \frac{1}{2} :: 100 : 25 \text{ per cent.}$; $19 - 15 = 4$; $15 : 4 :: 100 : 26 \frac{2}{3} \text{ per cent.}$; $26 \frac{2}{3} - 25 = 1 \frac{1}{3} \text{ per cent., which Y makes more than Q.}$

66. From Sept. 25 to Jan. 1 are 97 days = 139680 minutes.

From 23 minutes past 3 A. M. to midnight is 20h. 37m.

= 1237 minutes. From Jan. 1, 1787, to Jan. 1, 1844, are 57 years = $365 \times 57 \times 24 \times 60 = 29959200$ minutes. From Jan. 1, 1844, to July 4, 1844, are 185 days = $185 \times 24 \times 60 = 266400$ minutes. From Jan. 1, 1787, to Jan. 1, 1844, are 13 leap years; we have, therefore, to add the number of minutes in 13 days, $13 \times 24 \times 60 = 18720$ minutes. To these we add the minutes from 30 minutes past 5 A. M. to midnight = 1050 min.

139680
1237
29959200
266400
18720
1050

NOTE. We have reckoned but 13 leap years from Jan. 1, 1787, to Jan. 1, 1844, because 1800 was not a leap year.

Ans. 30386287 minutes.

(67.)

S.	°	'	"
3	14	26	14
8	19	43	28
Ans. 6	24	42	46

NOTE. As the moon is east of the star, and is also moving eastward in her orbit, we must add 12 signs to the minuend.

(68.)

A.	R.	p.	ft.
3	1	23	200
1	2	37	

A.	R.	p.	yd.	ft.	in
3	1	23	22	2	0
1	2	37	30	8	0
1	2	25	21	3	0
					$\frac{1}{2} = 2$
					36
1	2	25	21	5	36

We first reduce the 200 feet in the minuend to yards and feet, $200 \div 9 = 22\text{yd. } 2\text{ft.}$

(69.)

$$\frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = 2 \frac{1}{2} \text{ Ans.}$$

(70.)

£	s.	d.	qr.
1	19	11	3
1	19	11	3
1	19	11	3
1	17	11	$3\frac{1}{2}$
	1	9	$3\frac{1}{2}$
		1	$18\frac{1}{2}$
Ans. 3	19	11	$0\frac{1}{2}$

NOTE. The first product is obtained by multiplying the multiplicand by 1, the second product by multiplying it by $\frac{1}{2}$, the third product by multiplying by $\frac{1}{4}$, and the fourth product by multiplying by $\frac{1}{8}$.

71. \$ 100 — \$ 40 = \$ 60; \$ 60 : \$ 100 :: \$ 68.75 : \$ 114.58½ Ans.
72. \$ 134.40 — \$ 120 = \$ 14.40; \$ 120 : \$ 14.40 :: \$ 100 : \$ 12 per cent., Ans.
73. \$ 3600 + \$ 4200 + \$ 2200 = \$ 10000; \$ 15000 × .15 = \$ 2250; \$ 15000 — \$ 2250 = \$ 12750; \$ 12750 — \$ 10000 = \$ 2750; \$ 10000 : \$ 2750 :: \$ 36000 : \$ 990; Emerson's gain; \$ 10000 : \$ 2750 :: \$ 4200 : \$ 1155, Bailey's gain; \$ 10000 : \$ 2750 :: \$ 2200 : \$ 605, Curtis's gain.
74. 3½ in. × 2 = 7 in.; 4 ft. 9 in. = 57 in.; 3 ft. 7 in. = 43 in.; 2 ft. 11 in. = 35 in.; 43 × 2 = 86; 43 — 7 = 36; 35 — 7 = 28; 86 × 57 = 4902; 28 × 2 = 56; 56 × 57 = 3192; 36 × 28 × 2 = 2016; 4902 + 3192 + 2016 = 10110; 10110 ÷ 144 = 70½ square feet; 57 — 7 = 50; 43 — 7 = 36; 35 — 7 = 28; 50 × 36 × 28 = 50400; 50400 ÷ 1728 = 29½ cubic feet, Ans.
75. 64 × 2 = 128 ft.; 32 × 2 = 64 ft. From 64 ft. we subtract four times the thickness of the wall; 1 ft. 4 in. × 4 = 5 ft. 4 in.; 64 ft. — 5 ft. 4 in. = 58 ft. 8 in.; 128 ft. + 58 ft. 8 in. = 186 ft. 8 in. = length of the wall of the house.

ft.	in.	ft.	in.	ft.	in.	ft.	in.
186	8	7	4	2	8	3	8
	4		3	5	8	6	4
746	8	22	0	13	4	18	32
	7	3	8	1	9	14	2
3)5226	8	66	0	15	1	72	64 cubic inches [in a brick.
1742	2	14	8		4	18	
6968	10	80	8	60	5	252	
765	11				4		
6202	11			241	9		
12				80	8		
74435				252			
12				3)574	5		
893226				191	5		
12				765	11		

64)10718720(167,480 bricks, Ans.

76. $\frac{1}{2}$ and $\frac{1}{2} = \frac{1}{12}$ and $\frac{1}{12}$; $\frac{1}{12} + \frac{1}{12} = \frac{1}{6}$; $\frac{1}{6} : \frac{1}{12} :: \$1000 :$
 $\$571.42\frac{1}{2}$, Benjamin's share; $\frac{1}{6} : \frac{1}{12} :: \$1000 :$
 $\$428.57\frac{1}{2}$, Samuel's share.
77. As Bailey occupied the whole house the first three months, he must pay $\frac{1}{3}$ of $\$100 = \$33\frac{1}{3}$. As he occupied half of the next 3 months he must pay half of $\$33\frac{1}{3} = \$16\frac{2}{3}$, and Bricket must pay the same sum, $\$16\frac{2}{3}$. For the last 3 months, each must pay $\frac{1}{3}$ of $\$33\frac{1}{3} = \$11\frac{1}{3}$. $\$33\frac{1}{3} + \$16\frac{2}{3} + \$11\frac{1}{3} = \$61\frac{1}{3}$, Bailey's share of rent; $\$16\frac{2}{3} + \$11\frac{1}{3} = \$27\frac{2}{3}$, Bricket's share; $\$11\frac{1}{3} = \$11\frac{1}{3}$, Dana's share.
78. $42\frac{1}{2} \times 144 \times 2 = 12168$ square inches of surface. $3 \times 3 \times 2 = 18$ inches, the superficial contents of a side of two cubes, which measure 3 inches on each side. $12168 - 18 = 12150$; $12150 \div 6 = 2025$; $\sqrt{2025} = 45$; $45 + 3 = 48$ inches, Ans.

In order to understand the rationale of the above operation, the pupil will take six square pieces of board, which are of the same size. With them, let him construct a cubical box; and then, by examining it, he will find that he needs two small cubes, whose sides are equal to the thickness of the board or plank of which his box is constructed, in order to complete it. As our plank in the above question is three inches thick, the sides of each cube will be three inches, and the surface of one side will be $3 \times 3 = 9$ square inches, and of the two cubes, it will be $2 \times 9 = 18$ square inches. These 18 inches, therefore, must be subtracted from the surface of the plank, thus: $12168 - 18 = 12150$. These remaining inches are the surface of the six square boards, and $\frac{1}{6}$ of these will be the surface of one board, thus: $12150 \div 6 = 2025$. The square root, therefore, of this number will be one side of one of the boards. $\sqrt{2025} = 45$ inches. To this we must add the thickness of the plank or board, $45 + 3 = 48$ inches, Ans.

OPERATION BY ALGEBRA.

Let x represent the length of the outside of the box, and y the inside of it. Then

$$x - y = 6$$

$$\text{And } x^3 - y^3 = 36504.$$

$$x = y + 6.$$

By cubing both sides of this equation,

$$x^2 = y^2 + 18y^2 + 108y + 216.$$

Let this be substituted for x^2 in the second equation. Then

$$y^2 + 18y^2 + 108y + 216 - y^2 = 36504.$$

And by reduction,

$$18y^2 + 108y = 36504 - 216 = 36288.$$

$$y^2 + 6y = 2016.$$

$$y^2 + 6y + 9 = 2016 + 9 = 2025.$$

$$y + 3 = 45.$$

$$y = 45 - 3 = 42 \text{ inches, inside of the box.}$$

$$\text{And } 45 + 3 = 48 \text{ inches, outside of the box, Ans.}$$

79. \$100 — \$10 = \$90; \$100 + \$16 = \$116; \$116 — \$90 = \$26; \$26 : \$100 :: \$21.84 : \$84.00, real value of the horse; \$100 : \$90 :: \$84.00 : \$75.60, price paid, Ans.

80. \$100 — \$12 = \$88; \$88 : \$100 :: \$4.40 : \$5.00; \$100 : \$110 :: \$5.00 : \$5.50, Ans.

(81.)

Emily, Jane,	Abigail, Nancy,	\$ 19,000
Emily, Jane, Betsey,	Abigail,	19,200
Jane, Betsey,	Abigail, Nancy,	20,000
Emily,	Betsey, Abigail, Nancy,	20,500
Emily, Jane, Betsey,	Nancy,	21,300
		4) \$ 100,000

Sum of the fortunes, \$ 25,000

\$ 25,000 — \$ 19,000 = \$ 6,000, Betsey's fortune.

\$ 25,000 — \$ 19,200 = \$ 5,800, Nancy's fortune.

\$ 25,000 — \$ 20,000 = \$ 5,000, Emily's fortune.

\$ 25,000 — \$ 20,500 = \$ 4,500, Jane's fortune.

\$ 25,000 — \$ 21,300 = \$ 3,700, Abigail's fortune.

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1. That it is a complete system of itself, comprising all the elementary Rules, as well as those pertaining to the higher branches of the science, together with a full illustration and demonstration of their principles, and contains, it is believed, a greater amount and variety of matter strictly arithmetical, than can be found in any other treatise of the kind.

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